

THE
Psychological Review

EDITED BY

J. MARK BALDWIN HOWARD C. WARREN
JOHNS HOPKINS UNIVERSITY AND PRINCETON UNIVERSITY
CHARLES H. JUDD, Yale University (*Editor of the Monograph Series*).

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THE PSYCHOLOGICAL REVIEW.

THE RELATIONS OF LOGIC TO ALLIED DISCIPLINES.¹

BY PROFESSOR WILLIAM A. HAMMOND,
Cornell University.

In 1787, in the preface to the second edition of the *Kr. d. r. V.*, Kant wrote the following words: "That Logic, from the earliest times, has followed that secure method" (namely, the secure method of a science as attested by the unanimity of its workers and the stability of its results), "may be seen from the fact that since Aristotle it has not had to retrace a single step, unless we choose to consider as improvements the removal of some unnecessary subtleties, or the clearer definition of its matter, both of which refer to the elegance rather than to the solidity of the science. It is remarkable, also, that to the present day, it has not been able to make one step in advance, so that to all appearances it may be considered as completed and perfect. If some modern philosophers thought to enlarge it, by introducing *psychological* chapters on the different faculties of knowledge (faculty of imagination, wit, etc.), or *metaphysical* chapters on the origin of knowledge or different degrees of certainty according to the difference of objects (idealism, skepticism, etc.), or, lastly, *anthropological* chapters on prejudices, their causes and remedies, this could only arise from their ignorance of the peculiar nature of logical science. We do not enlarge, but we only disfigure the sciences, if we allow their respective limits to be confounded; and the limits of logic are definitely fixed by

¹ Paper read at the Congress of Arts and Science, St. Louis Exposition, 1904.

the fact, that it is a science which has nothing to do but fully to exhibit and strictly to prove the formal rules of all thought (whether it be *a priori* or empirical, whatever be its origin or its object, and whatever be the impediments, accidental or natural, which it has to encounter in the human mind).”— [Translated by Max Müller.]

Scarcely more than half a century after the publication of this statement of Kant's, John Stuart Mill (Introduction to *System of Logic*) wrote: "There is as great diversity among authors in the modes which they have adopted of defining logic, as in their treatment of the details of it. This is what might naturally be expected on any subject on which writers have availed themselves of the same language as a means of delivering different ideas. * * * This diversity is not so much an evil to be complained of, as an inevitable, and in some degree a proper, result of the imperfect state of those sciences" (that is, of logic, jurisprudence, and ethics). "It is not to be expected that there should be agreement about the definition of anything, until there is agreement about the thing itself." This remarkable disparity of opinion is due partly to the changes in the treatment of logic from Kant to Mill, and partly to the fact that both statements are extreme. That the science of logic was 'completed and perfect' in the time of Kant could only with any degree of accuracy be said of the treatment of syllogistic proof or the deductive logic of Aristotle. That the diversity was so great as pictured by Mill is not historically exact, but could be said only of the new epistemological and psychological treatment of logic and not of the traditional formal logic. The confusion in logic is no doubt largely due to disagreement in the delimitation of its proper territory and to the consequent variety of opinions as to its relations to other disciplines. The rise of inductive logic coincident with the rise and growth of physical science and empiricism, forced the consideration of the question as to the relation of formal thought to reality, and the consequent entanglement of logic in a triple alliance of logic, psychology and metaphysics. How logic can maintain friendly relations with both of these and yet avoid endangering its territorial integrity, has not been made clear by logicians or psy-

chologists or metaphysicians, and that, too, in spite of persistent attempts to justly settle the issue as to their respective spheres of influence. Until modern logic definitely settles the question of its aims and legitimate problems, it is difficult to see how any agreement can be reached as to its relation to the other disciplines. The situation as it confronts one in the discussion of the relations of logic to allied subjects may be analyzed as follows :

1. The relation of logic as science to logic as art.
2. The relation of logic to psychology.
3. The relation of logic to metaphysics.

The development of nineteenth century logic has made an answer to the last two of the foregoing problems exceedingly difficult. Indeed, one may say that the evolution of modern epistemology has had a centrifugal influence on logic, and instead of growth towards unity of conception we have a chaos of diverse and discordant theories. The apple of discord has been the theory of knowledge. A score of years ago when Adamson wrote his admirable article in the *Encyclopædia Britannica* (Article 'Logic,' 1882), he found the conditions much the same as I now find them. "Looking to the chaotic state of logical text-books at the present time, one would be inclined to say that there does not exist anywhere a recognized currently received body of speculations to which the title logic can be unambiguously assigned, and that we must therefore resign the hope of attaining by any empirical consideration of the received doctrine a precise determination of the nature and limits of logical theory." I do not, however, take quite so despondent a view of the logical chaos as the late Professor Adamson; rather, I believe with Professor Stratton (*PSYCH. REV.*, Vol. III.) that something is to be gained for unity and consistency by more exact delimitation of the subject-matter of the philosophical disciplines and their interrelations, which precision, if secured, would assist in bringing into clear relief the real problems of the several departments of inquiry, and facilitate the proper classification of the disciplines themselves.

The attempt to delimit the spheres of the disciplines, to state their interrelations and classify them, was made early in the history of philosophy, at the very beginning of the development

of logic as a science by Aristotle. In Plato's philosophy, logic is not separated from epistemology and metaphysics. The key to his metaphysics is given essentially in his theory of the reality of the concept, which offers an interesting analogy to the position of logic in modern idealism. Before Plato there was no formulation of logical theory, and in his dialogues it is only contained in solution. The nearest approach to any formulation is to be found in an applied logic set forth in the precepts and rules of the rhetoricians and sophists. Properly speaking, Aristotle made the first attempt to define the subject of logic and to determine its relations to the other sciences. In a certain sense logic for Aristotle is not a science at all. For science is concerned with some *ens*, some branch of reality, while logic is concerned with the methodology of knowing, with the formal processes of thought whereby an *ens* or a reality is ascertained and appropriated to knowledge. In the sense of a method whereby all scientific knowledge is secured, logic is a propædæutic to the sciences. In the idealism of the Eleatics and Plato, thought and being are ultimately identical, and the laws of thought are the laws of being. In Aristotle's conception, while the processes of thought furnish a knowledge of reality or being, their formal operation constitutes the technique of investigation, and their systematic explanation and description constitute logic. Logic and metaphysics are distinguished as the science of being and the doctrine of the thought-processes whereby being is known. Logic is the doctrine of the organon of science, and when applied *is* the organon of science. The logic of Aristotle is not a purely formal logic. He is not interested in the merely schematic character of the thought-processes, but in their function as mediators of apodictic truth. He begins with the assumption that in the conjunction and disjunction of correctly formed judgments the conjunction or disjunction of reality is mirrored. Aristotle does not here examine into the powers of the mind as a whole; that is done, though fragmentarily, in the *De Anima* and *Parva Naturalia*, where the mental powers are regarded as phases of the processes of nature without reference to normation; but in his logic he inquires only into those forms and laws of thinking which mediate proof.

Scientific proof, in his conception, is furnished in the form of the syllogism, whose component elements are terms and propositions. In the little tract *On Interpretation* (i. e., on the Judgment as *interpreter* of thought), — if it is genuine, — the proposition is considered in its logical bearing.

The treatise on the *Categories*, which discusses the nature of the most general terms, forms a connecting link between logic and metaphysics. The categories are the most general concepts or universal modes under which we have knowledge of the world. They are not simply logical relations; they are existential forms, being not only the modes under which thought regards being, but the modes under which being exists. Aristotle's theory of the methodology of science is intimately connected with his view of knowledge. Scientific knowledge in his opinion refers to the essence of things; for example, to those universal aspects of reality which are given in particulars, but which remain self-identical amidst the variation and passing of particulars. The universal, however, is known only through and after particulars. There is no such thing as innate knowledge or Platonic reminiscence. Knowledge, if not entirely empirical, has its basis in empirical reality. Causes are known only through effects. The universals have no existence apart from things, although they exist *realiter* in things. Empirical knowledge of particulars must, therefore, precede in time the conceptual or scientific knowledge of universals. In the evolution of scientific knowledge in the individual mind, the body of particulars or of sense experience is to its conceptual transformation as potentiality is to actuality, matter to form, the completed end of the former being realized in the latter. Only in the sense of this power to transform and conceptualize, does the mind have knowledge within itself. The genetic content is experiential; the developed concept, judgment, or inference is *in form* noëtic. Knowledge is, therefore, not a mere 'precipitate of experience,' nor is Aristotle a complete empiricist.

The conceptual form of knowledge is not immediately given in things experienced, but is a product of noëtic discrimination and combination. Of a sensible object as such there is no concept; the object of a concept is the generic essence of a thing;

and the concept itself is the thought of this generic essence. The individual is generalized; every concept does or can embrace several individuals. It is an 'aggregate of distinguishing marks,' and is expressed in a definition. The concept as such is neither true nor false. Truth first arises in the form of a judgment or proposition, wherein a subject is coupled with a predicate, and something is said about something. A judgment is true when the thought (whose inward process is the judgment and whose expression in vocal symbols is the proposition) regards as conjoined or divided that which is conjoined or divided in actuality; in other words, when the thought is congruous with the real. While Aristotle does not ignore induction as a scientific method (how could he when he regards the self-subsistent individual as the only real?), yet he says that, as a method, it labors under the defect of being only proximate; a complete induction from *all* particulars is not possible, and therefore cannot furnish demonstration. Only the deductive process proceeding syllogistically from the universal (or essential truth) to the particular is scientifically cogent or apodictic. Consequently Aristotle developed the science of logic mainly as a syllogistic technique or instrument of demonstration. From this brief sketch of Aristotle's logical views it will be seen that the epistemological and metaphysical relations of logic which involve its greatest difficulty and cause the greatest diversity in its modern exponents, were present in undeveloped form to the mind of the first logician. It would require a mighty optimism to suppose that this difficulty and diversity, which has increased rather than diminished in the progress of historical philosophy, should suddenly be made to vanish by some magic of restatement of subject matter, or theoretical delimitation of the discipline. As Fichte said of Philosophy, 'The sort of a philosophy that a man has, depends on the kind of man he is'; so one might almost say of logic, 'The sort of logic that a man has, depends on the kind of philosopher he is.' If the blight of discord is ever removed from epistemology, we may expect agreement as to the relations of logic to metaphysics. Meanwhile logic has the great body of scientific results deposited in the physical sciences on which to build and test, with some as-

surance, its doctrine of methodology; and as philosophy moves forward persistently to the final solution of its problems, logic may justly expect to be a beneficiary in its established theories.

After Aristotle's death logic lapsed into a formalism more and more removed from any vital connection with reality and oblivious to the profound epistemological and methodological questions that Aristotle had at least raised. In the Middle Ages it became a highly developed exercise in inference applied to the traditional dogmas of theology and science as premises, with mainly apologetic or polemical functions. Its chief importance is found in its application to the problem of realism and nominalism, the question as to the nature of universals. At the height of Scholasticism realism gained its victory by syllogistically showing the congruity of its premises with certain fundamental dogmas of the church, especially with the dogma of the unity and reality of the Godhead. The heretical conclusion involved in nominalism is equivalent (the accepted dogma of the church being axiomatic) to *reductio ad absurdum*. A use of logic such as this, tending to conserve rather than to increase the body of knowledge, was bound to meet with attack on the awakening of post-renaissance interest in the physical world, and the acquirement of a body of truth to which the scholastic formal logic had no relation. The anti-scholastic movement in logic was inaugurated by Francis Bacon, who sought in his *Novum Organum* to give science a real content through the application of induction to experience and the discovery of universal truths from particular instances. The syllogism is rejected as a scientific instrument, because it does not lead *to* principles, but proceeds only *from* principles, and is therefore not useful for discovery. It permits at most only refinements on knowledge already possessed, but cannot be regarded as creative or productive. The Baconian theory of induction regarded the accumulation of facts and the derivation of general principals and laws from them as the true and fruitful method of science. In England this empirical view of logic has been altogether dominant, and the most illustrious English exponents of logical theory, Herschel, Whewell and Mill, have stood on that ground. Since the introduction of German idealism in the last half century a

new logic has grown up whose chief business is with the theory of knowledge.

Kant's departure in logic is based on an epistemological examination of the nature of judgment, and on the answer to his own question, 'How are synthetic judgments *a priori* possible?' The *a priori* elements in knowledge make knowledge of the real nature of things impossible. Human knowledge extends to the phenomenal world, which is seen under the *a priori* forms of the understanding. Logic for Kant is the science of the formal and necessary laws of thought, apart from any reference to objects. Pure or universal logic aims to understand the forms of thought without regard to metaphysical or psychological relations, and this position of Kant is the historical beginning of the subjective formal logic.

In the metaphysical logic of Hegel, which rests on a panlogistic basis, being and thought, form and content, are identical. Logical necessity is the measure and criterion of objective reality. The body of reality is developed through the dialectic self-movement of the idea. In such an idealistic monism, formal and real logic are by the metaphysical postulate coincident.

Schleiermacher in his dialectic regards logic from the standpoint of epistemological realism, in which the real deliverances of the senses are conceptually transformed by the spontaneous activity of reason. This spirit of realism is similar to that of Aristotle, in which the one-sided *a priori* view of knowledge is controverted. Space and time are forms of the existence of things, and not merely *a priori* forms of knowing. Logic he divides into dialectic and technical logic. The former regards the idea of knowledge as such; the technical regards knowledge in the process of becoming or the idea of knowledge in motion. The forms of this process are induction and deduction. The Hegelian theory of the generation of knowledge out of the processes of pure thought is emphatically rejected.

Lotze, who is undoubtedly one of the most influential and fruitful writers on logic in the last century, attempts to bring logic into closer relations with contemporary science, and is an antagonist of one-sided formal logics. For him logic falls into the three parts of (1) pure logic or the logic of thought; (2)

applied logic or the logic of investigation; (3) the logic of knowledge or methodology; and this classification of the matter and problems of logic has had an important influence on subsequent treatises on the discipline. His logic is formal, as he describes it himself, in the sense of setting forth the modes of the operation of thought and its logical structure; it is real in the sense that these forms are dependent on the nature of things and not something independently given in the mind. While he aims to maintain the distinct separation of logic and metaphysics he says (in the discussion of the relations between formal and real logical meaning) the question of meaning naturally raises a metaphysical problem: 'Ich thue besser der Metaphysik die weitere Erörterung dieses wichtigen Punktes zu überlassen' (*Logic*, 2d ed., p. 571). How could it be otherwise when his whole view of the relations and validity of knowledge is inseparable from his realism or teleological idealism, as he himself characterizes his own standpoint?

Drobisch, a follower of Herbart, is one of the most thoroughgoing formalists in modern logical theory. He attempts to maintain strictly the distinction between thought and knowledge. Logic is the science of thought. He holds that there may be formal truth, for example, logically valid truth, which is materially false. Logic, in other words, is purely formal; material truth is matter for metaphysics or science. Drobisch holds, therefore, that the falsity of the judgment expressed in the premise from which a formally correct syllogism may be deduced, is not subject matter for logic. The sphere of logic is limited to the region of inference and forms of procedure, his view of the nature and function of logic being determined largely by the bias of his mathematical standpoint. The congruity of thought with itself, judgments, conclusions, analyses, etc., is the sole logical truth, as against Trendelenburg, who took the Aristotelian position that logical truth is the 'agreement of thought with the object of thought.'

Sigwart looks at logic mainly from the standpoint of the technology of science, in which, however, he discovers the implications of a teleological metaphysic. Between the processes of consciousness and external changes he finds a causal

relation and not parallelism. Inasmuch as thought sometimes misses its aim, as is shown by the fact that error and dispute exist, there is need of a discipline whose purpose is to show us how to attain and establish truth and avoid error. This is the practical aim of logic, as distinguished from the psychological treatment of thought, where the distinction between true and false has no more place than the distinction between good and bad. Logic presupposes the impulse to discover truth, and it, therefore, sets forth the criteria of true thinking, and endeavors to describe those normative operations whose aim is validity of judgment. Consequently logic falls into the two parts of (1) critical, (2) technical, the former having meaning only in reference to the latter; the main value of logic is to be sought in its function as art. "Methodology, therefore, which is generally made to take a subordinate place, should be regarded as the special, final, and chief aim of our science" (*Logic*, Vol. I., p. 21, Eng. Tr.). As an art, logic undertakes to determine under what conditions and prescriptions judgments are valid, but does not undertake to pass upon the validity of the content of given judgments. Its prescriptions have regard only to formal correctness and not to the material truth of results. Logic is, therefore, a formal discipline. Its business is with the due procedure of thought, and it attempts to show no more than how we may advance in the reasoning process in such way that each step is valid and necessary. If logic were to tell us *what* to think or give us the content of thought, it would be commensurate with the whole of science. Sigwart, however, does not mean by formal thought independence of content, for it is not possible to disregard the particular manner in which the materials and content of thought are delivered through sensation and formed into ideas. Further, logic having for its chief business the methodology of science, the development of knowledge from empirical data, it ought to include a theory of knowledge, but it should not so far depart from its subjective limits as to include within its province the discussion of metaphysical implications or a theory of being. For this reason, Sigwart relegates to a postscript his discussion of teleology, but he gives an elaborate treatment of epistemology extending through Vol. I.

and develops his account of methodology in Vol. II. The question regarding the relation between necessity, the element in which logical thought moves, and freedom, the postulate of the will, carries one beyond the confines of logic and is, in his opinion, the profoundest problem of metaphysics, whose function is to deal with the ultimate relation between 'subject and object, the world and the individual, and this is not only basal for logic and all science, but is the crown and end of them all.'

Wundt's psychological and methodological treatment of logic stands midway between the purely formal treatises on the one hand, and the metaphysical treatises on the other hand. The general standpoint of Wundt is similar to that of Sigwart, in that he discovers the function of logic in the exposition of the formation and methods of scientific knowledge; for example, in epistemology and methodology. Logic must conform to the conditions under which scientific inquiry is actually carried on; the forms of thought, therefore, cannot be separate from or indifferent to the content of knowledge; for it is a fundamental principle of science that its particular methods are determined by the nature of its particular subject-matter. Scientific logic must reject the theory that identifies thought and being (Hegel) and the theory of parallelism between thought and reality (Schleiermacher, Trendelenburg, and Ueberweg), in which the ultimate identity of the two is only concealed. Both of these theories base logic on a metaphysics, which makes it necessary to construe the real in terms of thought, and logic, so divorced from empirical reality, is powerless to explain the methods of scientific procedure. One cannot, however, avoid the acceptance of thought as a competent organ for the interpretation of reality, unless one abandons all question of validity and accepts agnosticism or skepticism. This interpretative power of thought or congruity of thought with reality is translated by metaphysical logic into identity. Metaphysical logic concerns itself fundamentally with the content of knowledge, not with its evidential or formal logical aspects, but with being and the laws of being. It is the business of metaphysics to construct its notions and theories of reality out of the deliverances of the special sciences and inferences derived therefrom. The aim of metaphysics is the

development of a world-view free from internal contradictions, a view that shall unite all particular and plural knowledges into a whole. Logic stands in more intimate relation to the special sciences, for here the relations are reciprocal and immediate; for example, from actual scientific procedure logic abstracts its general laws and results, and these in turn it delivers to the sciences as their formulated methodology. In the history of science the winning of knowledge precedes the formulation of the rules employed, that is, precedes any scientific methodology. Logic, as methodology, is not an *a priori* construction, but has its genesis in the growth of science itself and in the discovery of those tests and criteria of truth which are found to possess an actual heuristic or evidential value. It is not practicable to to separate epistemology and logic, for such concepts as causality, analogy, validity, etc., are fundamental in logical method, and yet they belong to the territory of epistemology, are epistemological in nature, as one may indeed say of all the general laws of thought. A formal logic that is merely propædæutic, a logic that aims to free itself from the quarrels of epistemology, is scientifically useless. Its norms are valueless, in so far as they can only teach the arrangement of knowledge already possessed, and teach nothing as to how to secure it or test its real validity. While formal logic aims to put itself outside of philosophy, metaphysical logic would usurp the place of philosophy. Formal logic is inadequate, because it neither shows how the laws of thought originate, why they are valid, nor in what sense they are applicable to concrete investigation. Wundt, therefore, develops a logic which one may call epistemological — methodological, and which stands between the extremes of formal logic and metaphysical logic. The laws of logic must be derived from the processes of psychic experience and the procedure of the sciences. 'Logic therefore needs,' as he says, 'epistemology for its foundation and the doctrine of methods for its completion.'

Lipps takes the view outright that logic is a branch of psychology; Husserl in his latest book goes to the other extreme of a purely formal and technical logic, and devotes almost his entire first volume to the complete sundering of psychology and logic.

Bradley bases his logic on the theory of the judgment. The logical judgment is entirely different from the psychological. The logical judgment is a qualification of reality by means of an idea. The predicate is an adjective or attribute which in the judgment is ascribed to reality. The aim of truth is to qualify reality by general notions. But inasmuch as reality is individual and self-existent, whereas truth is universal, truth and reality are not coincident. Bradley's metaphysical solution of the disparity between thought and reality is put forward in his theory of the unitary Absolute, whose concrete content is the totality of experience. But as thought is not the whole of experience, judgments cannot compass the whole of reality. Bosanquet objects to this, and maintains that reality must not be regarded as an ideal construction. The real world is the world to which our concepts and judgments refer. In the former we have a world of isolated individuals of definite content; in the latter, we have a world of definitely systematized and organized content. Under the title of the *Morphology of Knowledge* Bosanquet considers the evolution of judgment and inference in their varied forms. "Logic starts from the individual mind, as that within which we have the actual facts of intelligence, which we are attempting to interpret into a system" (*Logic*, Vol. I., p. 247). The real world for every individual is *his* world. "The work of intellectually constituting that totality which we call the real world is the work of knowledge. The work of analyzing the process of this constitution or determination is the work of logic, which might be described . . . as the reflection of knowledge upon itself" (*Logic*, Vol. I., p. 3). "The relation of logic to truth consists in examining the characteristics by which the various phases of the one intellectual function are fitted for their place in the intellectual totality which constitutes knowledge" (*ibid.*). The real world is the intelligible world; reality is something to which we attain by a constructive process. We have here a type of logic which is essentially a metaphysic. Indeed, Bosanquet says in the course of his first volume: "I entertain no doubt that in content logic is one with metaphysics, and differs, if at all, simply in mode of treatment — in tracing the evolution of knowledge in

the light of its value and import, instead of attempting to summarize its value and import apart from the details of its evolution" (*Logic*, Vol. I., p. 247).

Dewey (*Studies in Logical Theory*, p. 5) describes the essential function of logic as the inquiry into the relations of thought as such to reality as such. Although such an inquiry may involve the investigation of psychological processes and of the concrete methods of science and verification, a description and analysis of the forms of thought, conception, judgment and inference, yet its concern with these is subordinate to its main concern, namely, the relation of 'thought at large to reality at large.' Logic is not reflection on thought, either on its nature as such or on its forms, but on its relations to the real. In Dewey's philosophy, logical theory is a description of thought as a mode of adaptation to its own conditions, and validity is judged in terms of the efficiency of thought in the solution of its own problems and difficulties. The problem of logic is more than epistemological. Wherever there is striving there are obstacles; and wherever there is thinking there is a 'material-in-question.' Dewey's logic is a theory of reflective experience regarded functionally, or a pragmatic view of the discipline. This logic of experience aims to evaluate the significance of social research, psychology, fine and industrial art, and religious aspiration in the form of scientific statement, and to accomplish for social values in general what the physical sciences have done for the physical world. In Dewey's teleological pragmatic logic the judgment is essentially instrumental, the whole of thinking is functional, and the meaning of things is identical with valid meaning. (*Studies in Logical Theory*, cf. pp. 48, 82, 128). The real world is not a self-existent world outside of knowledge, but simply the totality of experience; and experience is a complex of strains, tensions, checks, and attitudes. The function of logic is the redintegration of this experience. "Thinking is adaptation to an end through the adjustment of particular objective contents" (*ibid.*, p. 81). Logic here becomes a large part, if not the whole, of a metaphysics of experience; its nature and function are entirely determined by the theory of reality.

In this brief and fragmentary *résumé* are exhibited certain characteristic movements in the development of logical theory, the construction put upon its subject-matter and its relation to other disciplines. The *résumé* has had in view only the making of the diversity of opinion on these questions historically salient. There are three distinct types of logic noticed here: (1) formal, whose concern is merely with the structural aspect of inferential thought, and its validity in terms of internal congruity; (2) metaphysical logic whose concern is with the functional aspect of thought, its validity in terms of objective reference and its relation to reality; (3) epistemological and methodological logic, whose concern is with the genesis, nature and laws of logical thinking as forms of scientific knowledge, and with their technological application to the sciences as methodology. I am not at present concerned with a criticism of these various viewpoints, excepting, in so far as they affect the problem of the interrelationship of logic and the allied disciplines.

For my present purpose I reject the extreme metaphysical and the extreme formal positions, and assume that logic is a discipline whose business is to describe and systematize the formal processes of inferential thought *and* to apply them as practical principles to the body of real knowledge.

I wish now to take up *seriatim* the several questions touching the various relations of logic enumerated above, and first of all the question of the relation of logic as science to logic as art.

I. *Logic as science and logic as art.*

It seems true that the founder of logic, Aristotle, regarded logic not as a science, but rather as propædæutic to science, and not as an end in itself, but rather technically and heuristically as an instrument. In other words, logic was conceived by him rather in its application or as an art, than as a science, and so it continued to be regarded until the close of the Middle Ages, being characterized indeed as the *ars artium*; for even the *logica docens* of the Scholastics was merely the formulation of that body of precepts which are of practical service in the syllogistic arrangement of premises, and the Port Royal Logic aims to furnish *l'art de penser*. This technical aspect of the

science has clung to it down to the present day, and is no doubt a legitimate description of a part of its function. But no one would now say that logic *is* an art; rather it is a body of theory which may be technically applied. Mill, in his examination of Sir William Hamilton's *Philosophy* (p. 391), says of logic that it 'is the art of thinking, which means of correct thinking, and the science of the conditions of correct thinking,' and indeed, he goes so far as to say (*Syst. of Log.*, Introd., Sect. 7): 'The extension of logic as a science is determined by its necessities as an art.' Strictly speaking, logic as a science is purely theoretical, for the function of science as such is merely to know. It is an organized system of knowledge, namely, an organized system of the principles and conditions of correct thinking. But because correct thinking is an art, it does not follow that a knowledge of the methods and conditions of correct thinking is art, which would be a glaring case of *μετάβασις εἰς ἄλλο γένος*. The art-bearings of the science are given in the normative character of its subject-matter. As a science logic is descriptive and explanatory, that is, it describes and formulates the norms of valid thought, although as science it is not normative, save in the sense that the principles formulated in it may be normatively or regulatively applied, in which case they become precepts. What is principle in science becomes precept in application, and it is only when technically applied that principles assume a mandatory character. Validity is not created by logic. Logic merely investigates and states the conditions and criteria of validity, being in this reference a science of evidence. In the very fact, however, that logic is normative in the sense of describing and explaining the norms of correct thinking, its practical or applied character is given. Its principles as known are science; its principles as applied are art. There is, therefore, no reason to sunder these two things or to call logic an art merely or a science merely; for it is both when regarded from different viewpoints, although one must insist on the fact that the rules for practical guidance are, so far as the science is concerned, quite *ab extra*. Logic, ethics, and æsthetics are all commonly (and rightly) called normative disciplines: they are all concerned with values and standards; logic

with validity and evidence, or values for cognition; ethics with motives and moral quality in conduct, or values for volition; æsthetics with the standards of beauty, or values for appreciation and feeling. Yet none of them is or can be merely normative, or indeed as science normative at all; if that were so, they would not be bodies of organized knowledge, but bodies of rules. They might be well-arranged codes of legislation on conduct, fine art, and evidence, but not sciences. Strictly regarded, it is the descriptive and explanatory aspect of logic that constitutes its *scientific* character, while it is the specific normative aspect that constitutes its *logical* character. Values, whether ethical or logical, without an examination and formulation of their ground, relations, origin, and interconnection, would be merely rules of thumb, popular phrases, or pastoral precepts. The actual methodology of the sciences or applied logic is logic as art.

II. *Relation of logic to psychology.*

The differentiation of logic and psychology in such way as to be of practical value in the discussion of the disciplines has always been a difficult matter. John Stuart Mill was disposed to merge logic in psychology, and Hobhouse, his latest notable apologete, draws no fixed distinction between psychology and logic, merely saying that they have different centers of interest, and that their provinces overlap. Lipps, in his *Grundzüge der Logik* (p. 2), goes the length of saying that "Logic is a psychological discipline, as certainly as knowledge occurs only in the Psyche, and thought, which is developed in knowledge, is a psychical event." Now, if we were to take such extreme ground as this, then ethics, æsthetics, and pure mathematics would become at once branches of psychology and not coördinate disciplines with it, for volitions, the feelings of appreciation, and the reasoning of pure mathematics are psychical events. Such a theory plainly carries us too far and would involve us in confusion. That the demarcation between the two disciplines is not a chasmic cleavage, but a line, and that, too, an historically shifting line, is apparent from the foregoing historical *résumé*.

The four main phases of logical theory include: (1) the

concept (although some logicians begin with the judgment as temporally prior in the evolution of language), (2) judgment, (3) inference, (4) the methodology of the sciences.

The entire concern of logic is, indeed, with psychical processes, but with psychical processes regarded from a specific standpoint, a standpoint different from that of psychology. In the first place psychology in a certain sense is much wider than logic, being concerned with the whole of psychosis as such, including the feelings and will and the entire structure of cognition, whereas logic is concerned with the particular cognitive processes enumerated above (concept, judgment, inference), and that, too, merely from the point of view of validity and the grounds of validity. In another sense psychology is narrower than logic, being concerned purely with the description and explanation of a particular field of phenomena, whereas logic is concerned with the procedure of all the sciences and is practically related to them as their formulated method. The compass and aims of the two disciplines are different; for while psychology is in different references both wider and narrower than logic, it is also different in the problems it sets itself, its aim being to describe and explain the phenomena of mind in the spirit of empirical science, whereas the aim of logic is only to explain and establish the laws of evidence and standards of validity. Logic is, therefore, selective and particular in the treatment of mental phenomena, whereas psychology is universal, that is, it covers the entire range of mental processes as a phenomenalist science; logic dealing with definite elements as a normative science. By this it is not meant that the territory of judgment and inference should be delivered from the psychologist into the care of the logician; through such a division of labor both disciplines would suffer. The two disciplines handle to some extent the same subjects, so far as names are concerned; but the essence of the logical problem is not touched by psychology, and should not be mixed up with it, to the confusion and detriment of both disciplines. The field of psychology, as we have said, is the whole of psychical phenomena; the aim of individual psychology in the investigation of its field is: (1) to give a genetic account of cognition, feel-

ing, and will, or whatever be the elements into which consciousness is analyzed; (2) to explain their interconnections causally; (3) as a chemistry of mental life to analyze its complexes into their simplest elements; (4) to explain the totality structurally (or functionally) out of the elements; (5) to carry on its investigation and set forth its results as a purely empirical science; (6) psychology makes no attempt to evaluate the processes of mind either in terms of false and true, or good and bad. From this description of the field and function of psychology, based on the expressions of its modern exponents, it will be found impossible to shelter logic under it as a subordinate discipline. If one were to enlarge the scope of psychology to mean Rational Psychology, in the sense which Professor Howison advocates (*PSYCH. REV.*, Vol. III., p. 652), such a subordination might be possible, but it would entail the loss of all that the new psychology has gained by the sharper delimitation of its sphere and problems, and would carry us back to the position of Mill, who appears to identify psychology with philosophy at large and with metaphysics.

In contradistinction to the aims of psychology as described in the foregoing, the sphere and problems of logic may be summarily characterized as follows: (1) All concepts and judgments are psychological complexes and processes and may be genetically and structurally described; that is the business of psychology. They also have a meaning value, or objective reference, that is, they may be correct or incorrect, congruous or incongruous with reality. The meaning aspect of thought, or its content as truth is the business of logic. This subject-matter is got by regarding a single aspect in the total psychological complex. (2) Its aim is not to describe factual thought or the whole of thought, or the natural processes of thought, but only certain ideals of thinking, namely, the norms of correct thinking. Its object is not a datum, but an ideal. (3) While psychology is concerned with the natural history of reasoning, logic is concerned with the warrants of inferential reasoning. In the terminology of Hamilton it is the nomology of discursive thought. To use an often employed analogy, psychology is the physics of thought; logic an ethics of thought. (4) Logic

implies an epistemology or theory of cognition in so far as epistemology discusses the concept and judgment and their relations to the real world, and here is to be found its closest connection with psychology. A purely formal logic, which is concerned merely with the internal order of knowledge and does not undertake to show how the laws of thought originate, why they hold good as the measures of evidence, or in what way they are applicable to concrete reality, would be as barren as scholasticism. (5) While logic thus goes back to epistemology for its bases and for the theoretical determination of the interrelation of knowledge and truth, it goes forward in its application to the practical service of the sciences as their methodology. A part of its subject-matter is therefore the actual procedure of the sciences, which it attempts to organize into systematic statements as principles and formulæ. This body of rules given implicitly or explicitly in the workings and structure of the special sciences, consisting in classification, analysis, experiment, induction, deduction, nomenclature, etc., logic regards as a concrete deposit of inferential experience. It abstracts these principles from the content and method of the sciences, describes and explains them, erects them into a systematic methodology, and so creates the practical branch of real logic. Formal logic, therefore, according to the foregoing account, would embrace the questions of the internal congruity and self-consistency of thought and the schematic arrangement of judgments to insure formally valid conclusions; real logic would embrace the epistemological questions of how knowledge is related to reality, and how it is built up out of experience, on the one hand, and the methodical procedure of science on the other. The importance of mathematical logic seems to be mainly in the facilitation of logical expression through symbols. It is rather with the machinery of the science than with its content and real problem that the logical algorithm or calculus is concerned. In these condensed paragraphs sufficient has been said, I think, to show that logic and psychology should be regarded as coördinate disciplines; for their aims and subject-matter differ too widely to subordinate the former under the latter without confusion to both.

I wish now to add a brief note on the relation of logic to another discipline.

III. *Relation of logic to metaphysics.*

As currently expounded, logic either abuts immediately on the territory of metaphysics at certain points or is entirely absorbed in it as an integral part of the metaphysical subject-matter. I regard the former view as not only the more tenable theoretically, but as practically advantageous for working purposes, and necessary for an intelligible classification of the philosophical disciplines. The business of metaphysics, as I understand it, is with the nature of reality; logic is concerned with the nature of validity, or with the relations of the elements of thought within themselves (self-consistency) and with the relations of thought to its object (real truth), but not with the nature of the objective world or reality as such. Further, metaphysics is concerned with the unification of the totality of knowledge in the form of a scientific cosmology; logic is concerned merely with the inferential and methodological processes whereby this result is reached. The former is a science of content; the latter is a science of procedure and relations. Now, inasmuch as procedure and relations apply to some reality and differ with different forms of reality, logic necessitates in its implications a theory of being, but such implications are in no wise to be identified with its subject matter or with its own proper problems. Their consideration falls within the sphere of metaphysics or a broadly conceived epistemology, whose business it is to solve the ultimate questions of subject and object, thought and thing, mind and matter, that are implied and pointed to rather than formulated by logic. Inasmuch as the logical judgment says something about something, the scientific impulse drives us to investigate what the latter something ultimately is; but this is not necessary for logic, nor is it one of logic's legitimate problems, any more than it is the proper business of the physicist to investigate the mental implications of his scientific judgments and hypotheses or the ultimate nature of the theorizing and perceiving mind, or the problem of causality in relation to his world of matter and motion, although a general scientific interest may drive him to seek a solution of

these ultimate metaphysical questions. Scientifically the end of logic and of every discipline is in itself; it is a territorial unity, and its government is administered with a unitary aim. Logic is purely a science of evidential values, not a science of content (in the meaning of particular reality, as in the special sciences, or of ultimate reality, as in metaphysics); its sole aim and purpose, as I conceive it, is to formulate the laws and grounds of evidence, the principles of method, and the conditions and forms of inferential thinking. When it has done this, it has, as a single science, done its whole work. When one looks at the present tendencies of logical theory, one is inclined to believe that the discipline is in danger of becoming an '*Allerleiwissenschaft*,' whose vast undefined territory is the land of '*Weissnichtwo*.' The strict delimitation of the field and problems of science is demanded in the interest of a serviceable division of scientific labor and in the interest of an intelligible classification of the accumulated products of research.

SOME EFFECTS OF INCENTIVES ON WORK AND FATIGUE.

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These experiments, consisting of three series, were conducted for the purpose of comparing quantitatively the amounts of work that were accomplished by the subject working under two different mental attitudes; one, that of mere doing because the subject was told to work as hard as he could and as long as he could with no idea of securing any specified result; the other, that of doing a prescribed task as long as strength endured; or, in other words, the one consisted in working to get tired, while the other consisted in procuring in connection with each exertion an actual result that could be seen and appreciated. With the first task all incentive, as, the watching of the instrument or the keeping track of his progress by counting strokes, was denied the subject; whereas under the second condition the subject was not only permitted to watch his strokes but was also stimulated to action part of the time by his being requested to count his strokes.

APPARATUS.

The apparatus used was Cattell's spring ergograph, the index of which marked the record of movements upon smoked paper on the revolving drum of an ordinary kymograph, a stationary support for the lower arm of the subject, and a metronome regulated to strike twice a second.

EXPERIMENTS.

The subject worked with his left hand. The fingers of the hand were placed under the base of the ergograph, and the carriage of the instrument was moved downward by the thumb once each second. The movements were timed by the beats of the metronome. One experiment consisted of the amount of

work done during the time the subject was able to move his thumb continuously.

Sharp pains, or cramps, in the muscles, muscular fatigue for the instant, always brought the subject's movements to a standstill, and this was invariably taken to be the end of an experiment, although by trial it was found that a rest of one or two seconds at such a time would so relieve the subject that he could resume work with considerable vigor for another period.

FIRST SERIES.

The first series of experiments included two classes. The nature of the first class, the no incentive class, constant throughout all the series, has already been fully described in the general description of the purpose of the experiments. To furnish a definite motive for the second class, blocks varying in thickness were inserted under the carriage of the ergograph. The subject was required to push merely to the block and to exert himself to see how many times he could reach it. After failing to touch the block he still pressed as closely to it as he could until strength failed.

This series was conducted between the hours of two (2) and four (4) p. m. on Tuesdays and Thursdays, and were continued during the first half of the college year of 1903-4. Three experiments per day were the rule with each subject excepting the experimenter, who for a few days worked double. On the average a rest of four minutes was taken between two experiments, and but one class of experiments was given in a day. A part of the time one class began the week's work and then the other was given first, so that the two classes might profit equally provided there was any advantage to be derived from the longer rest from Thursday to the following Tuesday.

No clamps were used to hold the lower arm. The experimenter grasped the wrist of the subject to keep it steady and thus to help the subject to confine his movements to his thumb alone. Much introductory practice was given to enable the subject to resist the inclination to use his whole arm each time the thumb and wrist muscles began to grow painful through the continued use.

Subjects.—Four persons, all experienced as laboratory reagents, acted as subjects, Miss Killen (K.), Mr. Shepard (S.), Dr. Pillsbury (P.), and the experimenter (W.).

Results.—In computing results the length of each stroke of the index of the ergograph as it was recorded on the sheet of the kymograph was measured in millimeters. These lengths were then read in kilograms in accordance with the scale of the spring marked on the ergograph. The length in millimeters of each stroke times one half its reading in kilograms—since the spring started from zero in each movement—represents the work of each stroke in kilo-millimeters, the unit of value for all the experiments, and the sum of the stroke values gives the total work of each experiment.

TABLE I.

CLASSES, 1 = NO INCENTIVE; 2 = INCENTIVE. UNIT = KILO-MILLIMETER.

Subject.	Class.	Experiments.	Total Work.	Average.	Mean Variation.	Gain per cent.
K.	1	24	23554	981.4	308.4	4.8
	2	26	26743	1028.5	341.8	
S.	1	11	39431	3584.6	729.1	42
	2	13	66187	5091.3	1076.6	
W.	1	32	120341	3760.6	916.8	15.6
	2	37	160890	4348.3	991.1	
P.	1	6	24535	4085.1	993.8	2.2
	2	5	20878	4175.6	309.6	

A comparison of the results given in the table above shows for all the subjects a gain in the work performed under the conditions of the second class, the interpretation of which we would state thus: the difference in the mental attitudes of the subject under the different conditions imposed upon him in the performance of his tasks affected in no uncertain manner the results accomplished by him; or, as a more general deduction, in seeking the greatest results in the amounts of work to be secured by bodily exertion, the mental attitude of the subject towards his work should be taken into consideration.

During the spring of 1903, Mr. Sherman, a student in the Michigan laboratory, made use of the ergograph in testing fatigue, and as his results have never been published and can

be turned to account in connection with my problem, I take the liberty of including his final averages within my report. The subjects were Mr. Sherman (Sh.) and Mr. Hayden (H.)

The problem on which he set out was to prove the influence of the back-stroke from the sensory endings in muscle and tendons of the moving member during motion upon the amount of work that could be accomplished. It was assumed that the motor output in attempted contraction when no motion resulted would be less than when there was actual movement. It was further assumed that the amount of the reduction in work performed could be measured by partially fatiguing a muscle in each of these methods during the same number of contractions, and then using the amount of work required to induce complete fatigue as an indication of the work previously performed.

However in the earlier series of experiments approximately the same amount of work that could be recorded was performed under each condition, first working freely and then working down to a block that checked the movement in its course, and then the amount of work required to complete the fatigue was measured. This was sufficient to show the inapplicability of the method first suggested for it was found that the block acted as an incentive, so that more work was recorded in the first forty or sixty contractions where that was used. For S. 9.62×10^8 as compared with 9.11×10^8 and for H. 9.38×10^8 and 9.31×10^8 . Still more anomalously it was discovered that after doing more work with the incentive than without there was less fatigue in the former as was shown by the fact that in the remaining forty strokes work amounting to only 3.66×10^8 could be performed where there had been no incentive while after work with incentive 4.81×10^8 ergs were required to complete the fatigue for S. and for H. the values were 3.72×10^8 and 4.27×10^8 respectively.

Table II. shows the complete records for work with and without incentive:

Mr. Sherman's results thus, while ostensibly obtained for another purpose, substantiate my conclusions recorded above. Each of his subjects, working under a definite mental stimulus as opposed to work of the 'no incentive' class, experiences less fatigue and accomplishes more work.

TABLE II.

CLASSES, 1 = NO INCENTIVE; 2 = INCENTIVE. AMOUNTS IN ERGS.

Subject.	Class.	Experiments.	Average.
Sh.	1	9	12.77×10^5
	2	8	14.435×10^5
H.	1	9	13.07×10^5
	2	9	13.65×10^5

SECOND SERIES.

The second series with the same original purpose in view was conducted during the last half of the same year. The experiments were of three types of requirements: The first class, 'no incentive,' corresponded in all details with the first class of the first series; the second class consisted of 30 strokes, each 18 mm. in length, to touch the block, and then 'no incentive' type for the rest of the experiment; the third class made use of the same block throughout the entire experiment, but the subject was required to press to the block and to continue to press *hard* as long as time would permit and still enable him to keep his strokes in unison of movement with the signals of the metronome moving as above. When the subject could no longer reach the block he continued with the longest possible strokes to the end of his strength.

During all the experiments of this series the lower arm of the subject was not only supported in a stationary rest but was also firmly clamped at the wrist and just below the elbow. It was found that the clamping of the arm in one rigid position made a more uniform condition in the use of the same muscles with each experiment than was possible in the first series, and at the same time the subject was freed from the constant watchfulness necessary to inhibit the use of the whole arm when only a part was wanted.

The subjects were S. and W., and the apparatus was the same as in the first series, excepting the arm support, which in this series had clamping devices. The experiments were conducted at 9 o'clock, A. M., on Tuesdays and Thursdays. Three experiments of the same class constituted a day's work for each subject, and a rest of ten minutes was given between experiments.

The amounts of work were computed as above and are expressed in the kilo-millimeter unit. No results were worked up until the series had been completed. Even the results of the first series were still unknown to the subjects.

TABLE III.

Subject.	Class.	Experiments.	Total Work.	Average.	Mean Variation.
S.	1	17	103119	6065	1096
	2	17	85108	5006	784
	3	18	51907	2883	294
W.	1	16*	100813	6300	2004
	2	18	109500	6083	1636
	3	18	71643	3980	1283

A simple comparison of the average amounts of work done under each class of experiments in this series will signify nothing, as there are influencing factors entering that are not measured quantitatively, *e. g.*, the amount of work done in the continued push of the third class, and also the mental effect produced by the pace set in the beginning of each effort of the second class by the thirty strokes of a different length. The only comparison that can be made quantitatively is one between the first class and the third class, and this comparison must be based upon the assumption that each stroke of the third class together with its 'continued push' equals the amount of work done in a corresponding stroke of the first class. Thus by ascertaining the number of strokes 18 mm. and more in length in each class and the amounts of work in addition to these we are able to make a comparison. Table IV. gives the results.

TABLE IV.

Subject.	Class.	Experiments.	Strokes.	Additional Work.	Average Strokes.	Average Additional Work.
S.	1	17	1098	9039	64.58	531.7
	3	18	1194	3570	66.33	198.33
W.	1	16	1073	4861	67.06	303.81
	3	18	1713	2270	95.16	126.11

Putting these average results on the same basis by reducing the increase of strokes of the third class over those of the first class to additional work, we may state for both subjects the dif-

ferences in attainments in the two classes of experiments in terms of additional work alone. For S. these amounts are, 1st class 531.7, 3d class 269.2; for W., 1st class, 303.81, 3d class 1,264.16. S. thus performed on the average for each experiment 262.5 k.-mm. more work in the 'no incentive' class than he did in the third class, just the opposite result from that of his first series of experiments. W.'s results, an average of 960.35 k.-mm., his increase in the third class, agree with his first records.

Some attention was given to introspections and these should enter into our further consideration of the results of this series.

S.: "I may as well stop. I'm not doing anything." In reality, he was still working.

"Pain ensues, then usually there is the feeling that I can't go any farther, can't accomplish anything even if I should try." "Couldn't reach it [block] any longer. When I couldn't hit it, I wanted to quit, no ambition to continue." "I prefer blocks because a definite record can be made. In the other experiment ['no incentive'] I'm doing nothing in particular."

W.'s introspections agree closely with those of S. W. "prefers blocks. There is more of a feeling of satisfaction in doing the work. It seems to amount to something."

The quantitative results of both S. and W. in the first series of experiments, and for W. in this comparison of the first and the third class of the second series, agree with the mental attitude of 'satisfaction,' and 'preference,' shown by the introspections. S.'s results in the second series alone disagree, yet this disagreement emphasizes the influence of a mental factor stronger than those just noted. A glance at Table IV. will show that S. after leaving the strokes of 18 mm. in length, the block in the third class, performed much more additional work in the first class than he did in the third class. (This is also true for W. and but for the fact that he had more extra strokes in the third class than S. had, W.'s results would have felt more strongly this influence.) Such a discrepancy in S.'s closing strokes plainly shows that because S., as he states in his introspections, 'couldn't reach the block any longer,' he fatigued sooner than he otherwise would.

The average results of the experiments of the first and the second class will not admit of mere quantitative comparison, yet in the light of the introspections given some interesting deductions we think can be gleaned from an attempt to make such a comparison. From a physical standpoint there is no reason why the work of the second class should not at least equal that of the first class, and in accordance with the results of the first series of experiments there is a mental factor entering in favor of making the second class exceed in amount the first class. But in reality there is for S. a loss of 1059 k.-mm. and for W. 217 k.-mm. with each experiment of the second class. The sudden dropping from doing a definite task to 'doing nothing in particular' caused both subjects to weaken in their total efforts. Through the continued use of a stimulus not sufficient to call forth their strongest efforts the subjects accepted the same as a standard, and when they were deprived of this standard objectively, its subjective influence still persisted to such an extent that the total accomplishments of the subjects were materially lessened.

THIRD SERIES.

The third series was carried on during the first semester of the year of 1904-5 and is the outcome of questionings about the value of the deductions of the second series, particularly those connected with S.'s results.

The same apparatus as in the second series was used, and three groups of experiments were performed. Within each group there were two classes, first, 'no incentive' and second with incentive. That the benefits arising from practice may be evenly distributed in our comparison of results the classes of each group were kept distinct from the other groups. The incentive in each group was furnished by a line drawn on the recording smoked sheet, 17 mm. from the top of the stroke for the first group, 24 mm. from the top for the second group, and completely beyond the reach of the subject for the third group. In working with incentive (2) the subject was instructed to watch his work, count his strokes, put forth his utmost effort with each stroke, and, when his work in the case of the first and second groups receded to the line he was to endeavor to reach the line

as often as possible. Instructions for the first class were the same as in the beginning of the first series. The number of experiments each day was regulated about the same as in the preceding series, and the times of day once fixed for each subject were kept as near constant as possible. Classes of experiments were also alternated to equally distribute advantages of rest. Between each two experiments a rest of five minutes was given.

The subjects were Dr. Pillsbury (P.), Mr. Shepard (S.), Mr. Bayley (B.), Mr. McSherry (Mc.), and Mr. Schottstaedt (Sc.) P. and S. were acquainted with the results of the first and the second series, but the other subjects were to the end of the experiments ignorant of their real purpose. All results were kept from the subjects, and computations are given in the kilomillimeter unit.

TABLE V.

FIRST GROUP OF THIRD SERIES.

Subject.	Class.	Experiments.	Total Work.	Average.	Mean Variation.	Gain per cent.
P.	1	9	31695	3521.6	455.4	68 +
	2	9	53307	5923	1451.1	
S.	1	9	62817	6979.6	832.6	22 +
	2	9	76695	8521.6	1136.2	
B.	1	9	50036	5559.5	799.2	14 +
	2	9	57261	6362.3	887.4	
Mc.	1	9	32076	3564	895.1	46 +
	2	9	46850	5205.5	1468.3	
Sc.	1	8	50139	6267.3	1563.1	35 +
	2	8	67961	8495.1	3849.6	

TABLE VI.

SECOND GROUP OF THIRD SERIES.

Subject.	Class.	Experiments.	Total Work.	Average.	Mean Variation.	Gain per cent.
P.	1	9	38857	4317.4	612.2	54 +
	2	9	60014	6668.2	655.1	
S.	1	9	62373	6930.3	799.1	4.8 +
	2	9	65410	7267.7	494.4	
B.	1	9	65271	7252.2	949.2	17 +
	2	9	76878	8542	905.7	

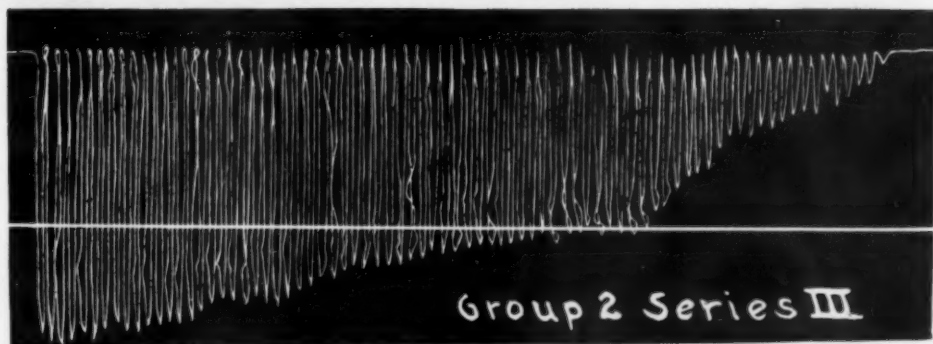
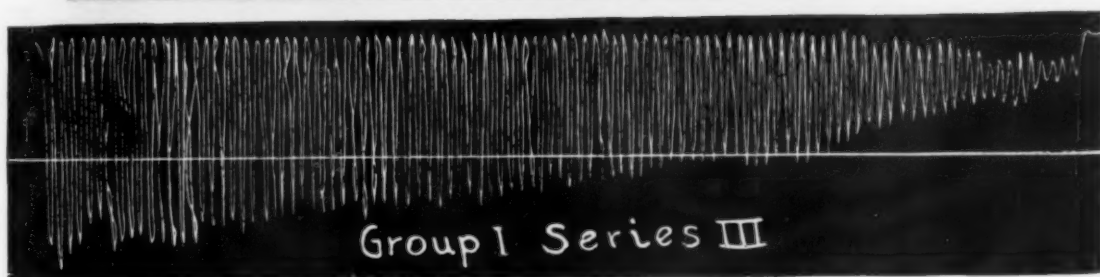
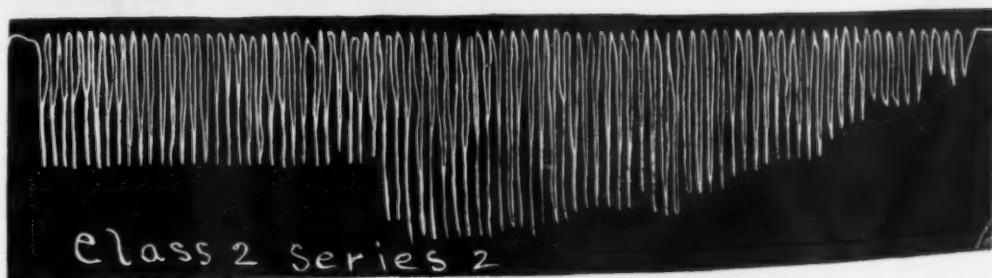
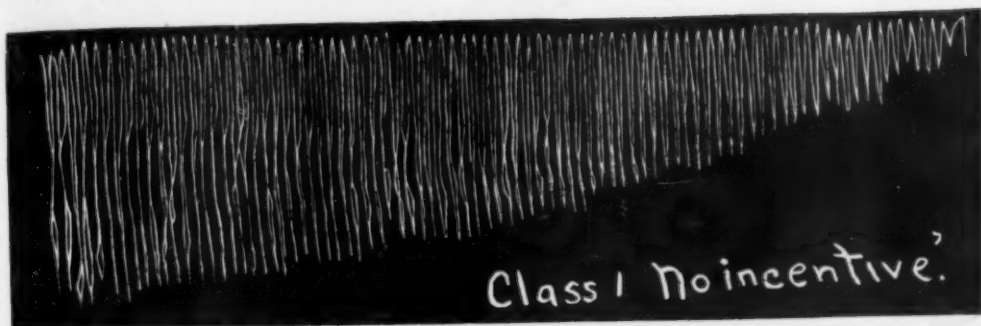
TABLE VII.
THIRD GROUP OF THIRD SERIES.

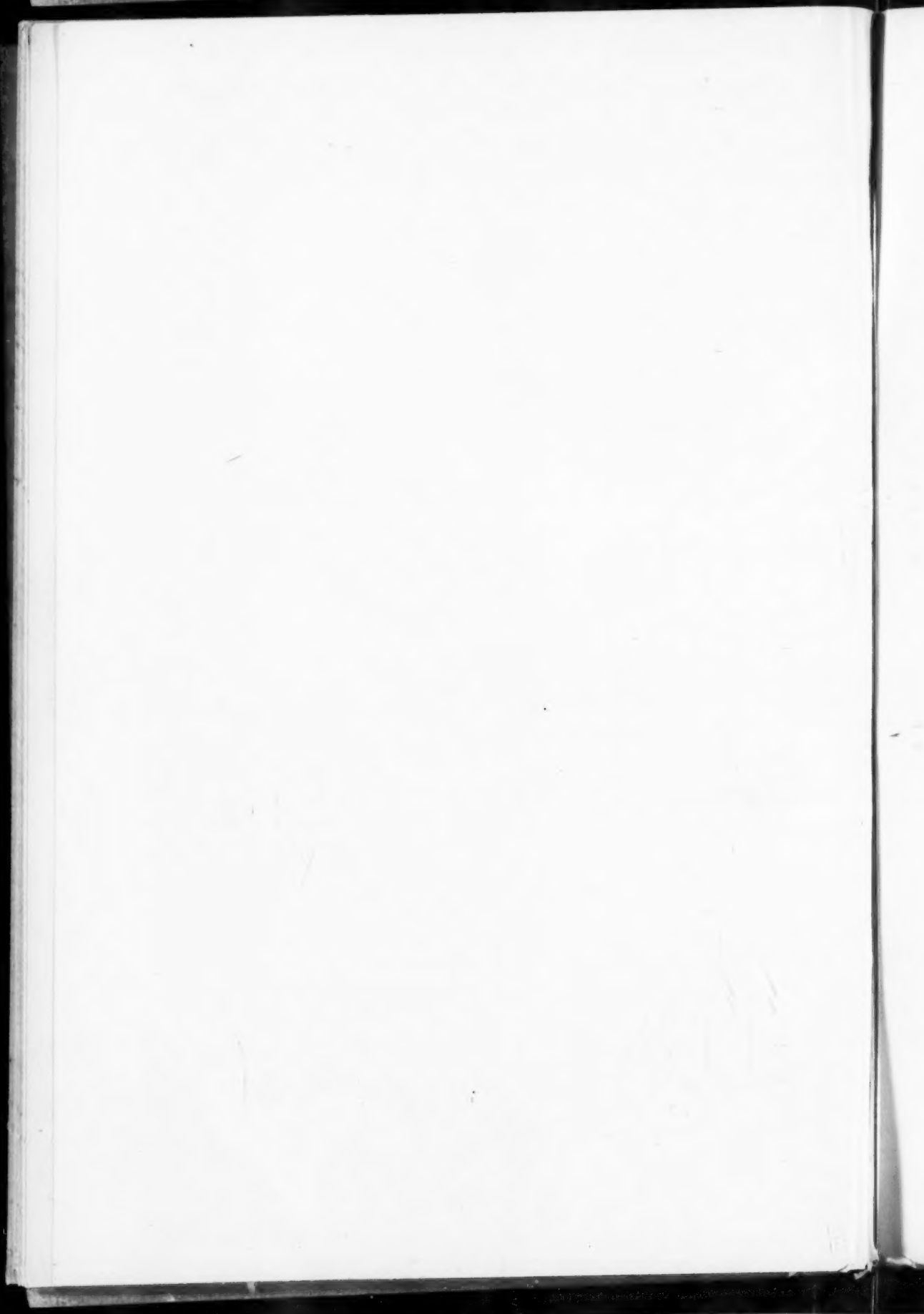
Subject.	Class.	Experiments.	Total Work.	Average.	Mean Variation.	Gain per cent.
P.	1	13	79838	6141.3	1463	30 +
	2	13	104359	8027.6	1674.1	
S.	1	16	151529	9470.5	1066.4	1.8 +
	2	16	154327	9645.4	1087	
B.	1	10	69238	6923.8	659	11 +
	2	10	77359	7735.9	725.1	
Mc.	1	6	36710	6118.3	790	6 —
	2	6	34346	5724.3	770.6	

The first group of this third series corresponds in the conditions of requirement to the first series of experiments, and the results in Table V., show conclusions agreeing with the first series, the gain on the side influenced by the added stimulus in the change of mental attitude toward the work ranging from 14 per cent. on the part of B. to 68 per cent. for P.

The second and the third group may also be viewed from the same standpoint and, with the exception of Mc. in the third group, all subjects show gains on the side of the added mental stimulus, and thus assist in strengthening our first conclusion, which it must be remembered has been an underlying assumption in our deductions of the second series. But, as to the real purport of the third series, *i. e.*, how far are we justified in our assumptions concerning the influences that caused S. in the third class, the push to the block and a continued push, and both S. and W. in the second class, 30 strokes with block and then 'no incentive' to the end, of the second series of experiments to depart from the result expected in the light of the first series?

It will be noted that the differences of conditions existing among the three groups of the third series of experiments are not of quality but of degree. The stimulus of the second classes sets a task more difficult of attainment as the groups progress from the first to the third, so that in the third group it is impossible for the subject to fully accomplish what he is told to do. Each subject realized that in this class he never touched the line yet each time at the beginning of the experiment he put forth





an effort with the determined purpose to reach the line. This factor the experimenter found upon inquiry remained present in consciousness throughout the third group, although it was desired to have the subject's mental attitude entirely dominated by the knowledge that his task was an impossibility in the one particular, and also to have his experiment performed under this condition alone. It must not be lost sight of that the presence of this other factor will cause an increase in the gains of the third group on the side of the extra mental stimulus, and that, if a decrease in amounts of gain from the first group to the third group can be shown in spite of this influence for an increase in the third group, of so much more worth are the conclusions to be drawn.

S. has a gain of 22 per cent. on the side of added mental stimulus in the first group. In the second group this gain falls to 4.8 per cent. and in the third group it is further reduced to 1.8 per cent. Here is shown a decrease of 78 per cent. between the first and the second group and a decrease of 62 per cent. from the second to the third group, or a drop of 91 per cent. from the first to the third group. (See Tables V., VI. and VII.)

This series of experiments so far as objective conditions are concerned admit of quantitative comparison and the factor of mental stimulus remains constant throughout, but S.'s results plainly show, what we in a measure assumed in the second series, that, on account of the added mental stimulus containing the element of impossibility, S. failed to secure as great results as when no such factor existed. In other words, S.'s 'couldn't reach it any longer, I wanted to quit, no ambition to continue,' his disturbing factor in the second series, becomes a fact and is shown to exert a positive influence toward decreasing his efficiency. Were S. alone in displaying this tendency, it might be argued that he may have been influenced in this last series by a foreknowledge of the results of the previous experiments, but a decrease in the same direction is shown by all the subjects. With Mc. it is so positive in its nature that he loses all the influence of the special stimulus in the third group and actually performs six per cent. more work on the other, the 'no incentive,' side.

Ten experiments, independent of the above series and conducted with Mc. alone, show so clearly the immediate effect of mental stimulus that I insert them here as a matter of mere added interest. A line 17 mm. from the top of the stroke of the ergograph was drawn on the carbon sheet. Five of the experiments were of the 'no incentive' class throughout, the remaining five were of the 'no incentive' class until the experimenter was positive that Mc., if left to his own course in his movements, would not have reached the line again. Then Mc. was told to look at his work, to press to the line and to hold to it in succeeding movements as long as possible. The changed mental stimulus affected thus only a small part of each of the five experiments. A comparison of these five with the five of the 'no incentive' class showed a gain 17 + per cent. in favor of the first, but a comparison of just the amount of work done under the influence of the suggestions or directions made to the subject by the experimenter with the corresponding portion of work of the other five experiments, that is, the work done in the 'no incentive' class after the subject's stroke had left the line, showed a gain of 339 per cent., the measure of the influence of the new mental stimulus.

SUMMARY.

We may say that at least three conclusions may be drawn from the results of these experiments.

1. The subject accomplished more work when working under the mental stimulus of having a set task to be performed than he did when working without a definite aim.
2. A known impossibility to accomplish the required conditions tends to decrease the subject's total results.
3. The fatigue accompanying work is not so great when the subject is working under the direct stimulus of a definite aim notwithstanding the fact that he has at the same time produced an increase in his amount of work.¹

¹ The MS. of this article was received May 4, 1905.—ED.

DISCUSSION.

THE PROBLEM OF THE SUBCONSCIOUS.

To anyone acquainted with recent psychological literature, an attempt at a critical definition or reconstruction of such terms as mental, conscious, and psychical, taken in a purely empirical and scientific sense, will not seem inopportune. There is no well-defined theory as to the precise limits of their meaning. Data, however, are available which offer a basis for at least a tentative mode of conception somewhat less open to objection than many that now pass current. Such apparent normal phenomena as dreams, mental lapses, absent-mindedness, the supposedly subliminal sensations, action upon suggestion, the sense of familiarity and the familiar experiences of trying to remember, the so-called subconscious phenomena of hypnotism, post-hypnotic suggestion, and double personality should certainly furnish material for some intelligible hypothesis as to the nature of consciousness and its relation to, or its distinction from, purely automatic processes.

In the inquiry here proposed, we have no interest in any philosophical or quasi-philosophical question. We wish simply to offer such a conception of the nature of consciousness, the term of ordinary psychological parlance, as will render intelligible such happenings as are mentioned above. All that we shall have to say will have no bearing upon the question of consciousness as an ultimate entity. In fact, we are quite prepared to agree with Professor James that in this sense it does not exist.

In its briefest form of statement, the problem is that of stating the relation between the conscious and the so-called subconscious, or unconscious, of seeking a conception which will organize the well-known facts of their manifestation. It is recognized at the outset that the best statement which can be offered can be no more than a working hypothesis, the validity of which can be established neither by an examination of the

brain itself nor by introspection. That neurology cannot furnish direct evidence goes without saying, and introspective evidence is impossible because, by definition, one of the elements to be considered is beyond the pale of introspection. If it could be so examined, the problem would cease to be. But even if direct verification is impossible, a working hypothesis is legitimate for even the most exacting experimentalist. Perhaps the ideal course would be to frame no hypotheses which cannot be directly proved. The fact, however, that we do make just such assumptions implicitly, if we avoid them explicitly, should be sufficient excuse for what is here proposed. There is a tendency on the part of psychologists to be somewhat chary of the subconscious, as if a good deal that passes under that category is open to suspicion. Certain phenomena are discounted, because to accept them fully seems to lead to dangerous consequences. The utterly unscientific and in the highest degree fanciful theories of a subconscious mind with extraordinary powers, an apparent recrudescence of the savage notion of the soul, which have of late years been advanced by certain pseudo-psychologists, have made us fearful of going too far. It is, however, because the psychologist has had no clearly scientific theory of these phenomena, that he has often in his own statements given ground and even authority for just the extreme views he wishes to avoid.

Let us note in the first place the outcome of some recent discussions of the subconscious. Professor Jastrow, in his article 'The Status of the Subconscious,'¹ attempts chiefly to relate what he regards as authentic subconscious happenings to the facts of ordinary waking consciousness. He refers to the well known phenomena of subliminal sensations, holds that the subconscious is analogous to the normal dream consciousness, and, in general, maintains that the most pronounced subconscious phenomena are really of the same species as our common mental lapses, cases of absentmindedness and of habit. We get no clue from his discussion as to just how he conceives the relation between clear consciousness and these subliminal events. The net outcome is that there *are* certain occurrences which

¹ *The American Journal of Psychology*, Vol. XIV., July-Sept., 1903.

may be called subconscious and which are not objectively different from the events of ordinary conscious experience. Of course the problem still remains of how the existence of these facts of common experience and the supplementary ones of kindred nature brought to light by the experimentalist affect our general theory of consciousness.

Professor Stratton¹ also holds to the theory of habit, neural and mental, as furnishing the safest explanation for most cases of the so-called subconscious. He holds that there is insufficient evidence in the case of memory for the supposition that ideas can persist as a low degree of the activity characteristic of consciousness, and that the past must be thought of as influencing the present through some sort of neural or mental dispositions. Thus, "The former acts themselves are dead and gone, and what remains is not even a pale image or copy of them, but * * * the person in enacting them formed a habit or disposition by which such acts could as often as he pleased be reënacted, but never literally preserved." As to the phenomena of the threshold, he feels that the evidence is insufficient for subliminal sensations, but with reference to the discriminative threshold, it is somewhat more convincing. His discussion need not be repeated here. We are concerned rather with his conclusion which is as follows: "The results are not in favor of unconscious ideas, but rather of unconscious materials out of which conscious ideas arise. They lead us to acknowledge that there are indiscernible occurrences in the mind of a very definite and non-mythical character, comings and goings of dim sensations, subtle variations in the strength and the quality of certain constituents, which are sufficient to destroy the equilibrium and produce transformations in the whole mental state."²

To the present writer there is much ambiguity in this last statement. How shall the clause that the evidence is against unconscious ideas be reconciled with the following one that 'there are indiscernible occurrences in the mind of a very definite and non-mythical character * * * dim sensations, etc.? We may well agree with what he says regarding unconscious

¹ *Experimental Psychology and Culture*, p. 74.

² *Ibid.*, p. 92.

ideas for the expression itself is meaningless unless we take ideas to mean something quite different from what they are ordinarily supposed to be. Suppose, however, that the very essence of the idea is not that it is conscious, that it is an entity of some sort, a psychic something if we please, which may or may not be conscious, but which may in any case remain an idea. Upon what sort of evidence would such a theory of ideas rest? Manifestly not upon introspection and if not upon that, what remains? Certainly there is no way for the observation of another to furnish proof. The greatest refinement of the means of observing and testing can reveal only more and more refined physical processes.

But notwithstanding the first part of his statement as quoted above, Professor Stratton seems to hold to a belief in something that is psychical, or mental, and yet unconscious, for he says we are led 'to acknowledge that there are indiscernible occurrences in * * * dim sensations,' etc. Thus if there are not unconscious ideas we are at least led to infer that there is at any rate something psychical out of which ideas are formed, shreds of ideas, as it were. For what else can occurrences *in the mind* be if not something psychical or mental? The apparent ambiguity in Professor Stratton's statement is typical of much of the present thought upon these topics. There certainly are activities and events that may be called subliminal. The problem is as to how they shall be conceived and their relation to consciousness be stated.

Dr. Boris Sidis in his recent work, *Multiple Personality*, suggests the most thoroughgoing answer in terms of his theory of 'moments consciousness.' His thought, in brief, seems to be that one's psychic life at any time is made up of several moments (of) consciousness of varying degrees of intensity. Each of these moments has a definite center of interest with various contributing elements organized about it. A moment consciousness is fundamentally a system, within which are synthesized various psychic states.¹ Is the moment (of) consciousness to be conceived as something over and above the psychic states synthesized? He says explicitly that 'the psychic individuality

¹ *Multiple Personality*, p. 231.

cannot be regarded as a series of independent physical events,¹ but that it is made up of psychic events, which are unconscious until organized into the 'moment consciousness.' It is further held that 'a moment consciousness must not be considered as something apart from its content,' that it exists wherever and whenever psychic states are synthetized; it *is* the synthetized psychic material.² Apparently then, he also believes in the existence of a psychic material previous to its appearance in consciousness. Dr. Sidis then proceeds to show that various subconscious activities, the phenomena of double personality, etc., may be conceived in terms of the emergence of one or another system of psychical elements. The system of moment consciousness may be really unconscious in the ordinary sense of the word for the author is careful to distinguish between consciousness and self-consciousness. There is a self-consciousness threshold beneath which 'moments consciousness' may still exist. There are a good many passages that seem clearly to indicate a belief in a psychical substratum beneath self-consciousness.³ Thus the author in one place speaks of 'the dissociation and disaggregation of systems of central neural elements with their concomitant psychic systems or moments consciousness.' Again, 'In the first cycle of multiple consciousness none of the moments are well organized, each of the leading functioning moments can maintain itself above the threshold of personality only a short time.'⁴ "The higher moments, on account of their absence during the state of disaggregation, have no memory for the experiences of the lower moments. A dissociated moment consciousness can remember only its own experiences."⁵ "When the higher moment of self-consciousness becomes disaggregated and a lower type of moment takes its place, a break occurs between the two moments, the experience of the lower moment is not transmitted to the higher moment."⁶

Dr. Sidis' theory of consciousness as a synthetizing activity is most significant, as is also his contention that different organ-

¹ *Ibid.*, p. 231.

² *Ibid.*, p. 338.

³ *Ibid.*, p. 307.

⁴ *Ibid.*, p. 232, italics mine.

⁵ *Ibid.*, p. 358.

⁶ *Ibid.*, p. 307, 8.

izations of neural elements may exist in relative independence. We shall take issue with him on the point as to whether there can coexist more than one center, or moment of consciousness, and further, whether there is a psychic substratum to self-consciousness, for it is to be remembered that he distinguishes between consciousness and self-consciousness.

We wish to ask, first of all, whether, assuming that some sort of neural activity is always present with conscious processes, it is also necessary to assume that wherever there is neural activity there must also accompany it some sort of dim consciousness. Marshall, in his *Instinct and Reason*, makes such an assumption. Every neurosis has its psychosis, according to him. Whether he means by this a dim fragment of consciousness, it is hard to say. If he does not mean this, but distinguishes between the psychic and the conscious, his whole position is a mere conceptual fiction. The same is true regarding the distinction, above referred to, between consciousness and self-consciousness. We know in ourselves only conscious states, and these are also states of self-consciousness in so far as they are conscious at all. We hold that is meaningless to use consciousness in any other sense than self-consciousness. If there is little of the one, there is, in proportion, little of the other. In the nervous systems of others we can conceivably observe only physical processes. Where, then, is there any evidence for psychic states, other than those which are consciously experienced?

Dr. Sidis, as well as Marshall, holds that there is something psychical in even the simplest forms of animal life, and that this is an elementary form of consciousness of the same type as that consciousness of man which is not self-consciousness. The question may well be raised as to whether this view is not as extreme as that of Descartes, with which it is contrasted, viz: that all animals are merely automata. What if we cannot tell definitely where consciousness ends in the animal series, are we then forced to conclude that it is at least dimly present in all forms of animal life? To be sure, this assumption is not precisely equivalent to that of Marshall's, to which reference was made above, namely, that every nerve element when active

has its accompanying psychosis. According to this latter view, complete consciousness would apparently be the sum, or resultant, of the activity of all these psychic atoms. On such an hypothesis the problem would arise of how, if there are given to start with discrete elements within a single organism, there can be built up the unity of intention and purpose with consciousness certainly means to most of us. The objection to Marshall's theory, is, in a word, that the psychic atom is purely a conceptual fiction, which may be a legitimate fiction, but, if such, it must prove its worth in explaining the data furnished by introspection. Here it is conspicuously deficient in a most vital particular, viz., in that consciousness, as we know it, is something unitary. It certainly conveys no suggestion of being composed of discrete elements.

Dr. Sidis, in his theory of the 'moment consciousness' apparently avoids this difficulty by defining consciousness as a synthetizing activity, or as the 'synthetized psychic material,' but no matter how synthetized or organized, the elements seem to be still upon our hands. The analogy of the physical organism will make our objection clearer. The various members and organs are organized into one body, but the parts are still *there* objectively. The moment consciousness is, however, a unique experience, the parts of which, if there are such, are transformed by being organized and no longer exist as elements. If such is the case, we assert again that the psychic element is a fiction, the necessity of which in our conception of consciousness has not as yet been proved.

Aside from the particular objection, urged above, to the theory of psychic elements, both it and the other theory, that all forms of animal life have some degree of consciousness, are to be criticized for conceiving consciousness as something existing *per se*, independently of any functional relation to action. That is, just *because* there is a neural process, it is assumed that there *must* be a conscious or a psychical process. There is certainly good reason to believe that there is automatic nervous action in ourselves, and, moreover, consciousness, as far as we are concerned, *does* seem to have such a direct functional relation to action. Is it not then much more in accord with the

facts of experience to assume that neural action is accompanied by psychical processes only when there is some necessity for them?

In the theory, which we wish here to outline, there is assumed, as a background, a continuum of neural processes and tensions. Such a condition certainly exists in the complex nervous system of the human being. Like a delicately adjusted mechanism, it is constantly affected in varying degrees by the infinitely varied changes in its environment. There is no reason for supposing that much of this activity of our nervous systems is in any appreciable degree organized or unified. It is simply a great mass of more or less isolated responses to all kinds of stimuli. If there is any grouping in these responses, it must be along the lines of preëxisting instinct or acquired habit. Now, it is to be noted, under some circumstances consciousness appears in connection with this mass of neural disturbance. As already stated, we are not here concerned with any theory of the ultimate relation existing between consciousness and matter, nor with the philosophical problem as to whether consciousness is an existence or not; we simply note the empirical fact that sometimes there is consciousness and sometimes there is not, and we are seeking to define the objective conditions of its appearance.

As a working conception, consciousness may be held to be definitely related to the facilitation of reactions and adjustments required by the life process but which the automatic arrangements of the organism cannot meet. When the automatic apparatus fails in a crisis and no new adjustment is forthcoming, the form perishes. In some organisms, however, something appears which we call consciousness, which rapidly mediates new and perhaps more adequate adjustments. What it comes from and what it ultimately is, it is not within our province to speculate. We only note that it is present under certain conditions and that it seems to perform certain functions. Now, in its function as an adjusting agency, it *does* synthesize acts and bring to bear upon them various portions of the past experience of the organism concerned. Hence, it seems reasonable to suppose that the neural changes lying back of a con-

scious process differ from the great mass, or matrix surrounding them in being somewhat more definitely organized than they. In other words, we at least so far agree with Dr. Sidis in conceiving of consciousness as a synthetizing process and further in assuming that the neural processes involved have a corresponding organization.¹

As far as a conscious process is concerned, it may be said to be best symbolized, for purposes of description, as a point. It does not have extent, neither does it consist of parts, so that, at any one moment, it cannot be said to contain elements of varying intensity. Although it may be true that objects do in varying degrees affect consciousness, or that many objects may be in consciousness at a given instant, it does not follow that it itself is composed of states of varying intensities, or that it could be represented, for instance, by a circle of gray, the center of which is white and the circumference black, with all intermediate shades of gray between these extremes. That is to say, consciousness does not shade off gradually into unconsciousness. It either exists or does not exist; it may be more intense at one moment than at another. It may even at some moments be said to be at a minimum. But at any one moment it is, for purposes of description, a unitary existence without parts which might be thought as clustering about a center with different degrees of intensity and adhesion. That is to say, the 'fringe' conception does not describe a characteristic of the edge of consciousness, in the sense that any conscious state possesses a psychic halo; it rather symbolically represents the fact that the *point of consciousness* is modified by outlying neural processes as well as by those most directly concerned in effecting the required adjustment.²

¹ *Op. cit.*, p. 358.

² *Cf.* "The whole effect of these obscure contents of consciousness on the attention, fuses, according to the general law of the synthesis of affective components, with the feelings attending the clearly conscious contents, thus forming a single total feeling." (Wundt, *Outlines of Psychology*, p. 237.) We hold that these "obscure contents" are not conscious in any sense except through the fact of fusion itself. *Cf.* also Angell, *Psychology*, p. 395: "There is a gradual fading out from a focal center of clearest consciousness toward a dimmer region of partial consciousness, which we may designate the zone of the *subconscious*. This subconscious area," etc. It is just this conception of conscious-

On the neural side we do have a mechanical system capable of spacial representation. There is an organized center with an outlying body of processes more or less directly contributing to the central movement, or tension. Thus there may properly be said to be a gradation in the neural changes according to their degree of connection with a central organization. We hold that it is a mistake to suppose that, since many neural activities may in different degrees contribute to the central activity, there are also varying degrees of consciousness clustering about a central and more intense state. It may be conceived as the concomitant of a certain organization of neural processes, each one of which contributes to its existence, not by furnishing a psychic atom, but merely by contributing to the central physical process. Consciousness is, then, not the sum or the organization of psychic elements, but rather the unique and single accompaniment of a peculiar organization of neural processes.

It is evident that each neural element will determine the complexion of consciousness in proportion as it contributes to the general trend of organized physical activity. If and so far as it is within the central system it has conscious value. If it is outside that system, or only remotely connected with it, it has no psychic value except in a prospective sense, that is, that it may be the raw material for some future system which shall be conscious. The chief reason for its being out of the pale of consciousness is its lack of organization with the adjusting center of activity. In the outer region, which is unconnected with the central organization, are all the neural responses to the vast mass of stimuli which for one reason or another fall in the field of inattention. There can be no doubt that their number is very large. Weakness of neural action is probably another cause of the failure of a process to affect consciousness. Here are to be classed the subliminal sensations referred to by Jastrow and others. Although not conscious themselves, their existence is proved by the fact that consciousness is, in certain instances, appreciably modified by them, because of their presence within

ness on the analogy of a field or zone that is here disputed. It suggests the notion at least that there are *bits* of relatively faint consciousness clustered about a center of intense consciousness.

the central plexus. As Miss Calkins, in her review of Jastrow's article suggests,¹ the subconscious, due to inattention, should be carefully distinguished from that due to diminishing intensities of stimuli. In the former case the neural process is outside the configuration which is correlated with consciousness, while in the latter it may be within the configuration but so subdued as to have, under ordinary circumstances no appreciable effect.

As may be inferred from what has just preceded, we propose to conceive of the subconscious, not as dim consciousness, nor as something psychic, and yet not self-conscious; but rather as a physical mass of neural dispositions, tensions, and actual processes which are in some degree, perhaps, organized; the remnants of habits, experiences, both those which have lapsed from consciousness and those which have never penetrated to the central plexus. Here also are hereditary traits and tendencies which have never chanced to be sufficiently relevant to the trend of processes which lay back of consciousness to succeed in contributing to them. We believe that this theory of the conscious and the subconscious is capable, with possibly slight modifications, of explaining all the phenomena that are usually discussed under these heads. The possibility of such application we shall now try to show.

When consciousness is present, the neural processes involved are much more intense than otherwise. Whether the relationship between intensity and consciousness is one of causality or of concomitance, we need not say. It is probable that the relatively great activity of the central system tends to inhibit, or to reduce to mere dispositions all other neural processes. The ordinary dream-consciousness is, on our theory, a condition in which the central activity is so subdued or dissipated that more or less fragmentary or isolated neural dispositions are aroused, or, perhaps better, liberated. In the hypnotic sleep the center of activity is shifted in a greater or less degree, resulting in the temporary lapse from consciousness of some processes and the incorporation of others which were previously mere neural dispositions. In double and multiple personality there are one or more unusually well organized potential sys-

¹ PSYCHOLOGICAL BULLETIN, September, 1904.

tems of neural elements which, under appropriate stimuli, can separately become sufficiently active to be conscious. The last stages of the case of Mr. Hanna, recorded by Dr. Sidis, apparently necessitate our assuming that there can be two or more coincident conscious systems. But the evidence is not conclusive. The mere fact that the two personalities could emerge at once, indicates that they had in so far begun to be organized into a single system.

Such phenomena as those of post-hypnotic suggestion, so-called unconscious cerebration, and the like, bring to light an important characteristic of this matrix of neural dispositions, namely, the possibility of a certain amount of elaboration, of combination and recombination among them, independently of the assistance of anything psychic. It is certainly not unreasonable to suppose that many combinations may be effected automatically, in part, over the pathways of habit, and in part through the agency of hereditary predispositions to certain forms of organization. Thus a sense impression may be taken up by some neural system, which is, for the time being, without the central plexus, changes may result in the system, combinations of processes may be brought about, which would otherwise have remained separated, nervous force may be redistributed, until such an arrangement of elements and an accumulation of tensions may result as will bring about a connection with the center which is accompanied by consciousness. The only way to account for the appearance in consciousness of fully formed ideas, which apparently have no antecedents, is to suppose that in some neural system, determined either by habit or hereditary tendency, there have been a succession of changes which have eventually led to a connection with the center, or that in the center changes have occurred, which have brought it into closer relation with some unconscious neural system, with the result of raising it to consciousness.¹ If our descrip-

¹ The writer is willing to admit that there is normally even less automatic activity in the outlying neural dispositions, than is here assumed, especially in view of the evidence adduced by Dr. Prince in his recent paper in this journal. Dr. Prince, however, cites nothing which is inconsistent with the theory here presented, *i. e.*, of consciousness as a point rather than as a complex of psychic atoms, although his own theory of the matter is not the one

tion seems too fanciful, we may say that all we care to insist upon is simply that neural action is not confined to the central plexus, but that, even without it, there are changes and seemingly important combinations effected.

Turning from this conception of the subconscious as merely a mechanical mass of neural dispositions and subdued neural processes, let us note further the extent to which it may be conceived as having a certain amount of organization, and how, if it is so regarded, the many evidences of a precisely opposite character may be interpreted.

In the first place, the phenomena of the 'fringe' as discussed by Professor James in his *Principles of Psychology*, are striking evidence that the subconscious is more than a scrap-heap. It is true that here he does not appear to connect the fringe with the subconscious. In fact they are shown to be radically unlike. The latter is called the 'tumbling ground for whimsies' while the former has a perfectly definite significance, and certainly affords no basis for capricious opinion. In other words, with its feelings of direction and the like, which seem to guide one, in a train of thought, from one idea to another, the fringe is obviously closely related to logical processes.

When, however, we come to defining these feelings of relation with care, the antithesis between them and subconscious phenomena is not so evident. Of course, in so far as the fringe is present in consciousness it is not *merely* neural. As already pointed out, the central configuration of neural elements may be and is surrounded by other elements which contribute in varying degrees to the onward movement of the center. They may modify the activity of the center sufficiently to appear above the threshold as 'feelings of direction,' but, as stated before, they are not themselves to be thought of as furnishing a dim psychic halo about a central point of intense consciousness. The 'halo of relations' possessed by each idea or image, is merely the immediate neural setting of the idea. It is certainly much simpler to regard this setting as a part of the subcon-

here presented. The point of this paper is that what is not in self-consciousness is a physical tension or process. Dissociated ideas are not psychical affairs at all.

scious neural activity, to which reference has been made, than to attempt a separate explanation. The chief difficulty, according to our previous conceptions, of classing them together, is the seeming incompatibility of a chaos and a high degree of logical consistency. If, however, there is evidence for a good deal of organization among entirely unconscious neural processes, the difficulty would seem in a measure to disappear.

It has already been suggested that the principle of habit furnishes a basis for a certain amount of organization in the processes not immediately connected with the center. It is well known that the reasoning process is guided largely by habit, preformed dispositions, emotional preferences and the like. The trained reasoner differs from the naïve chiefly in the sort of a background from which he works, not in the way in which he is affected by it. Previous experience is never merely haphazard, and a train of rational thought may be conceived as merely a conscious redefining of limited portions of preëxisting but spontaneous organizations of the elements of experience.

The seeming chaos of the subconscious is more apparent than real. We know it only as its processes chance to form connections with the center, or when the center is so disorganized and dissipated that they can effect a synthesis which is conscious. Under such circumstances they seem by contrast with normal consciousness to be simply masses of rubbish, disconnected tendencies, irrational, uncontrolled impulses. We have already called the central neural configuration, with its concomitant of consciousness, the adjusting point of the psycho-physical organism. Naturally, here all the canons of logical thought have been evolved; the very fact that it is the adjusting center proves that reasoning is its special prerogative. It is *the* center of control. The subconscious is thus apparently a region without a logic and without control. Within limits this is true, but it is equally true that there is another aspect of subconscious activity. As it has here been considered, *it* may represent more adequately the character of its possessor than does the central configuration of any one moment. Hence under certain circumstances there may be a certain corrective value in falling back upon these marginal tensions.

Professor Leuba has given an excellent description of some extreme forms of this in his article entitled 'The State of Death.'¹ It appears in less marked degree in the ideal of self-abasement, dying to one's self, humility, the cultivation of the spiritual life, etc., as these conceptions are held by the ordinary member of the Christian Church. The results aimed at under cover of these terms are real and have a certain value with reference to the rest of consciousness. Professor James put the matter tersely when he said, 'The hubbub of the waking life might close a door which in the dreamy subliminal might remain ajar or open.'² We need not and do not suggest with him that some supernatural agent might communicate with the devotee through the fringe regions. It may still be true nevertheless that within these regions there is a certain healing virtue. Its tensions represent, or are in part, the sublimation of the values out of all previous experience. The conscious center, in so far as it is an adjusting apparatus, is inadequate as an index to life as a whole. From its very nature its view must be partial. Thus it may at times be worth while to permit the focus to be dissipated that the outlying regions, in so far as they represent one's life in a truer perspective, may assert themselves. The religious notion of dying to one's self and obtaining instead a divine life is by no means meaningless, even if we reject its mystical interpretation. It is certainly a good thing, sometimes, for one to stop striving and let past values come in as correctives of present stress. Life as seen from the point of stress is bound to be distorted.

It seems to the writer that many of the critics of the latter part of *The Varieties of Religious Experience* have, in their haste to discredit James' suggestion regarding the possibility of extra personal influences through the subliminal, missed an important point in his discussion. May not his really vital point be just here, that the view of life from the center of the struggle is distorted and needs correction from the emotional values which life as a whole has left us?³

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¹ *American Journal of Psychology*, Vol. XIV., July-September, 1903.

² *Varieties of Religious Experience*, p. 241.

³ The MS. of this article was received May 9, 1905. — ED.

THE PLACE AND VALUE OF THE MARGINAL REGION IN PSYCHIC LIFE.

Recent discussions of the psychology of religion have focussed attention on the relative value of the reasoned and the unreasoned, the fringe and the center of consciousness, in their bearing upon belief and upon life.¹ Some regard the marginal region as an independent source of knowledge, in some way superior to the intellect, while others disparage the former, and consider only the center of the conscious field productive of anything really reliable. No decision on this point should be made until after a thorough analysis of the marginal region. The purpose of this paper is to make such an analysis and to assign to the region in question its proper place in the totality of mental life.

With this in view a general division of the psychical elements must first be made. And to spare the reader a tedious discussion which is aside from the main issue and which can be found well enough in many psychology books, I will say in brief that I accept the classification of psychic phenomena used by Ebbinghaus and Professor Royce — namely, sensory experience, ideation or thought, and feeling.

I do not include will or conation in this ultimate division, for to my mind will is not an element at all. If we take up a writer like Sully who maintains the elementary character of conation, and read his description of it, the effect is bewildering. One hundred and fifty pages are given to the subject, and a great mass of psychical material is included under the term conation; but all this material turns out to be ultimately either sensation or ideation or feeling, and the will itself or conation, as distinct from the other psychical elements, always eludes our grasp. The truth is, if you look for will as an element you can never find it, for it is a compound — the most inclusive of all psychic compounds. It is a matter of the succession of states of consciousness and is not to be found in any cross-section of the stream. You can never single it out from its psychic context as you can feeling, and say, This is pure will. You can never put your finger on it. It is no more a given *matter* which you *find* than association is. Will and association *occur*; they are not given. They are processes; not elements. To include will in an enumeration of the elements of psychic life is like saying the competitors in a race were A., B., C. and swiftness; or like speaking of the circulatory system as containing venous blood, arterial blood, and circulation.

¹ Cf. especially Professor James' 'Varieties of Religious Experiences' and Dr. Irving King's article on the 'Differentiation of the Religious Consciousness,' in the PSY. REVIEW Monograph Supplement, No. 127.

In saying this I do not wish to be interpreted as denying the primacy of volitional, conative life. The whole stream of consciousness may very well be considered a matter of conation; my point is that no one element of it alone can be considered to *be* conation, to the exclusion of the rest. Activity is a very real thing; but psychological analysis never finds it except in terms of feeling, sensation, etc., all of which it combines into itself.¹ This view is well put in Professor Royce's *Psychology*: "All consciousness without exception may be considered as accompanying our acts, or at all events as taking place side by side with the tendencies to action which are at any moment aroused within our organism. And thus all consciousness without exception may be considered as an expression of the will."²

To erect sensory experience and ideation into independent divisions is, I confess, more or less arbitrary. That they are nearer to each other than either is to feeling cannot be denied, and the two might very well be considered subdivisions of one large class which would be called the *rational* or the *describable*. The two, however, are certainly far from being identical, and it seems to me simpler and better to regard each as a separate class. Not only do they differ in their physiological causes; they differ also in character. As compared with sense perceptions, mental images are uniformly pale, incomplete, poor in content, and fleeting. Nor does this fully state the difference. Images and perceptions may vary, according to Professor Münsterberg, in three ways, namely, in quality, intensity, and vividness. Will any or all of these variations combined account for the difference between a perception and its corresponding image? Compare the sensation of a gray color to which we pay little attention, and the memory image of it to which we pay much attention. The difference is great; but it is not a difference of vividness, nor of intensity, nor of quality. It is a fourth factor, which may best be expressed by calling it a difference in kind, which separates sensory experience from ideation as decidedly — though not so distantly — as ideation is separated from feeling.

I shall, therefore, as I said, consider sensory experience, ideation or thought, and feeling, as the ultimate elements of psychic life. If feeling, however, is to retain the limited meaning of pleasure-pain, this classification is obviously unsatisfactory, because incomplete. It is too neat and prim, so to speak, for the hurly-burly of our actual inner life. Our psychic experience is not made up entirely of these definite and clear-cut forms. And I, therefore, propose to include under feel-

¹ Cf. Professor James' article, 'The Experience of Activity,' *PSY. REVIEW*, XII., 1-7.

² Page 164.

ing the phenomena of the marginal region. The 'fringes,' which weave themselves around our clearest ideas; the vague meanings which are yet no meanings and which are neither ideas nor feelings; sensations unattended to and unlocalized, and so little discriminated that without stretching the term we cannot call them sensations at all; the facts of subconscious mental activity which cannot be denied — in short all that heterogeneous mass of rich but indescribable psychic material which we call the 'background of consciousness' is not to be left out of account and is best classified here. And by this I do not mean to include clearly localized, clearly differentiated, and perfectly describable sensation, to which for the moment we are paying only partial attention, but the subjective and irrational mass of conscious stuff which is not susceptible of scientific description. Whether feeling in its more limited sense of pleasure-pain should be included under the same term used to denote this vast primordial, chaotic mass of psychic material is, I confess, largely a question of ease of exposition. On the one hand, it is true, that some feelings — *e. g.*, an intense pain — come into the center of attention and may be contrasted with the background. Yet between this differentiated feeling and the vague marginal region there is no cleft, but a steady decrease of differentiation in which no line can be drawn; and all pains — if we leave out positive pain *sensations* (Ebbinghaus' proposed 'Stichempfindung,' for instance¹) — have the same lack of clear-cut outlines, the same irrational and private nature that characterizes the background. Within any of the 'elements' of mind, upon any classification, subdivisions may be made — in sensory experience, for instance, there is great difference between sight and hearing, and even between red and blue, in the same sense. The fact therefore that pleasure-pain when in clear consciousness differs from some of the vague experiences of the background should not prevent their classification under a single head. And that feeling in the narrower sense is at any rate more closely allied to the vaguer constituents of the fringe region than are sensation or ideation can hardly be denied. Höfding defines feeling as 'that in our inward states which cannot by any possibility become an element of a percept or of an image. It is an inner illumination which falls on the stream of sensations and ideas.'² If this definition be accepted (and I believe it should), feeling should be classed with the other indescribable and irrational phenomena referred to. It is true that both for feeling and for these other experiences, by an artificial transformation, sensations may

¹ *Grundzüge der Psychologie*, p. 352.

² Höfding, *Outlines of Psychology*, p. 89.

in a sense be substituted; but when this substitution has been made the real feeling and the real background phenomena have vanished.¹ There is in every complex which involves either of these a factor which simply is not to be objectified and described. So far as accurate scientific description is concerned psychology must here 'throw up the sponge.' In this respect, feeling and what I may call the fringe experience differ *in toto* from sensation and ideation. For this reason, therefore, and also because of the facility with which the two run together, I shall class the vaguer phenomena and pleasure-pain under one heading. To me feeling is the type of the entire marginal region; it carries up into comparatively clear consciousness with no great alteration the original psychic character of the latter.

I shall not attempt to coin a new word for this third element of consciousness, but shall use a variety of terms for it, in general sticking to the name feeling. I therefore warn the reader that for the purpose of this paper feeling shall not mean merely pleasure-pain, but shall have the broad connotation above indicated.

What, now, more in detail, are the characteristics of this vast field of feeling? First of all should be mentioned its intimate and direct relation to the life of the organism. Sensation and ideation relate us to the outer world removed from us by time and space; the feeling mass of which I speak is indissolubly connected with our vital functions. So far as we are conscious of these functions at all, that consciousness belongs mainly in the affective life. Cœnæsthesia — as the German term *Gemeingefühl* implies — is a matter of feeling. The conscious rhythms of the bodily processes — especially as indicating the healthy or unhealthy conditions of the organism — are summed up in this common marginal feeling. "Es ist die 'Resultante der sinnlichen Gefühle' (Wundt); das 'Totalgefühl, in welchem der gesammte Zustand unseres sinnlichen Wohl — oder Uebelbefindens zum Ansdruck kommt' (Höfdding). Seine Wichtigsten Bestandtheile sind, neben den deutlicher localisirten Muskel-und Organempfindungen, die völlig unbestimmten Totalempfindungen, ein Conglomerat von betonten, aber meist nicht sehr starken Gefühlen, welche ihren Ursprung in inneren Veränderungen unserer Organe haben" (Ziegler).² In short we may say that ideation is man's consciousness so far as he is a rational being; the affective background is his consciousness so far as he is a living organism. It is this which is in connection with our vital needs. The instinctive desires and impulses have their

¹ Cf. Royce, *Outlines of Psychology*, pp. 107-112.

² Elsénhaus, 'Ueber Verallgemeinerung der Gefühle,' *Zeitschrift für Psy.*, XXIV., 203.

roots in it, and get their power from it, the inborn reactions upon the environment, so far as they are conscious, the native antipathies and tendencies, our deepest loves and hates — all these are parts of it or grow up out of it. In fact, so inextricably is it bound up with life and all that life means, that it might well be called the *vital* background.

This vital background seems to be the primary form of consciousness. In all probability the lower forms of conscious life have little beside this. Ideation would seem to belong exclusively to the very highest vertebrates, and sensation also becomes less varied and less definite as we work down in the scale of consciousness. Our own 'lower' senses have the most *feeling* (in the broad sense), and the intellectual ones the least, and as Ward points out, our organic sensations which seem to come nearest to those of the mollusc, lack almost any assignable quale. The infant's consciousness is void of what *we* know as sensations or ideas; it is 'a buzzing, blooming confusion. "In place of the many things which we can now see and hear," says Ward, "not merely would there then be (*i. e.*, in the infant's consciousness) a confused presentation of the whole field of vision and of a mass of undistinguishable sounds, but even the difference between sights and sounds themselves would be without its present distinctness. Thus the further back we go, the nearer we approach to a total presentation having the character of one general *continuum* in which differences are latent."¹

Out of this 'continuum,' this matrix, this original chaos, big with all the possibilities of conscious life, are gradually differentiated the various forms of sensation and of ideation. Consciousness is not put together from sensations ready made by the outside world, but, from the comparatively homogeneous mass of the feeling background, certain pulses of psychic life more prominent than the rest become more definite, more distinct, and by a gradual process evolve into sensations. The same is true of the differentiation of ideas. The process seems analogous to that of biological evolution, and might very well be described by Spencer's famous definition — 'a progress from indefinite, incoherent homogeneity to definite, coherent, heterogeneity, through successive differentiations and integrations.'

But while much that in the mollusc and the infant belonged to

¹ Encyc. Brit., article 'Psychology.' It will be noticed that in adopting Ward's view of the primitive consciousness instead of Spencer's or Stanley's I have avoided those difficulties which Höffding, Tawney and others urge against the possibility of feeling in the narrower sense being the original form of psychic life.

this feeling mass has with the adult human being developed into clear-cut sense perception and thought, a great part of the most developed human consciousness retains its primitive, rich, undifferentiated character. The logical and orderly mind of the most 'cut-and-dried' logician, who thinks in abstract concepts and reasons in fixed syllogisms of the figure Barbara, has still a great mass of 'fringe' and 'margin' and 'background.' The human logic machine is an invention of the imagination: and the most abstract thinker has always more of the 'blooming buzzing confusion' in the back of his mind than he would be willing to confess. And fortunate it is for him that it is so; for without it he would lack one of the most fecund sources of ideas with which human nature is blessed. Thought arising from feeling is a common experience of every one. Who has not listened to an argument and *felt* its fallacy long before he could put his finger on the weak spot? Who has not searched for a lost name and caught the tingle of it, the '*feel*' of it, long before he could grasp its definite ideational or sensational form? And not only is our general *Weltanschauung* determined quite as much by the affective life as by logical arguments, but in their very inception also, many of our most inclusive and most important thoughts and systems of thought come to us in a whirl of feeling most vague and indeterminate at first, and have to be worked out afterwards into clear formulation. The logical form is often the last product; the idea germinates in the feeling background and grows up out of it. Probably most philosophers — certainly many of them — *feel* their thoughts as vague tendencies long before they can express them. "The condition behind discovery is a *sense* or *feeling* of harmony or discord among phenomena, and of adjustment or maladjustment between consciousness and its objects."¹

The entire psychic life is characterized by varying degrees of differentiation. Between the clearly focalized idea and its fringe, between the discriminated sensation and its feeling-tone there is no impassable gulf that may not be spanned by imperceptible gradations. With respect to differentiation Leibnitz's *lex continui* holds of the mind. Especially is this illustrated in the feeling mass. Some of its material has almost forced itself out of the obscurity of the background into the clear consciousness of ideation or sense perception or some compound of these; some has even reached the focal point of attention, as for instance intense pain. From this maximum of differentiation the feeling mass slopes down through all degrees of discrimination

¹ Starbuck, 'The Feelings and Their Place in Religion.' *American Journal of Religious Psychology and Education*, I., 168.

obedient to the law of Leibnitz, until it reaches the zero line. There is good reason, moreover, to believe that the Father of German Psychology was right in another of his assertions, and that the feeling background does not stop with the zero line, but passes by a continuous transition into the subliminal region. Certainly if there be such a thing as the 'subconscious' it is a continuation of the field of vital feeling; and though psychologists differ in their interpretation of the subconscious region, the existence of that region not many doubt. Not to mention abnormal phenomena, experimental evidence has been adduced by Jastrow, Dunlap, Stratton, and others which seems to point toward the influence of the subliminal upon judgment. Thus in a long series of experiments Dunlap found that shadow lines thrown at certain angles but too faint to be consciously discriminated influenced the judgment of lengths of other lines;¹ and in Jastrow's experiment two weights not perceptibly different, when merely *guessed* many times gave results much nearer correct than could be accounted for by chance.² In these cases the feeling background, perhaps in part above and in part below the threshold, seems more delicately adjusted to its environment than the cognitive, rational factors.

How the subconscious should be construed I cannot pretend to say. Myers' hypothesis of a second personality seems to me unsupported by the facts. I can only suggest that from the focus of attention (of the conscious personality, of course) there stretches out an indefinitely extended field of psychic stuff, becoming constantly less differentiated, some of it passing the zero line of one's awareness, and flowing out in what I might call dream waves — or possibly disconnected, split-off pulses of consciousness — beyond. These subliminal dream-waves would be made up of the same kind of psychic material as the feeling background, only still less discriminated, or even cut off from the main psychic mass. Both would seem to be intimately connected with the life of the organism, and, if the experiments cited and others like them are worth anything, to be in some respects more responsive to certain slight sensuous — and possibly other — changes in the environment than is the fully conscious and rational personality.

If the subconscious region be conceived thus as not differing in character of content from the conscious background we should naturally expect its products, like those of the latter, to be good, bad and indifferent; and thus the 'dissolutive' phenomena would be much better accounted for than on the hypothesis of a subliminal person-

¹ See Stratton, *Experimental Psychology*, p. 189.

² Jastrow, 'The Status of the Subconscious,' *Am. Jr. of Psy.*, XIV., 343-353.

ality. It would seem, moreover, that different individuals differ enormously in the amount of subconscious material connected with the conscious field. And one thing more may perhaps be added: namely, that as Professor James has suggested, this region *seems* to have another environment besides the conscious one; it *seems* to point to a beyond. All that I have said as to the subconscious, is, however, thrown out merely as suggestion; and even if it be true, it is but a very small part of the truth; it leaves untouched a great many of the facts. I am aware also that the little I have said is most vague—but perhaps its vagueness is its only merit. So little is known as yet about the subconscious region that I for one have not the temerity to attempt to unify it. Of this, however, we may be sure: ‘there is actually and literally more life in our total soul than we are at any time aware of.’¹

The objective, describable, communicable regions of consciousness, ideation and sensation, may therefore be considered as two small islands, bathed in the sea of vital feeling. This sea in its whole extent—from the subconscious up to the maximum of differentiation—seems to be in a constant state of turmoil. It is forever boiling, so to speak, and throwing up upon the shores of the clearer consciousness all manner of products. Emotions are constantly coming and going, and suggesting an endless number of ideas and actions; sensations normally subliminal or nearly so suddenly become clearly discriminated; ideas ‘pop into our minds’ without any connection with our previous train of thought; the solution of the problem comes without the argument that discovered it; a course of action we find already determined upon, wise but apparently not based on reasoning; intuitions of all sorts shoot out of the dark background; the youth suddenly *discovers* that he is in love and that he has been in love for a considerable time without knowing it; the poet finds the poem half-written before he thinks of writing one. This spontaneous character of the vital background often gives its contributions a sense of foreignness, a feeling that they must have come from some source not ourselves—a feeling pointed out by Professor James in connection with the subconscious portion of this field.²

It is largely through this irrational, vital feeling mass that we are united to our own past, to our ancestors, and to the race,—in fact in a sense to all living things. It is the inheritor of our past and forms what might be called a feeling-memory. At every moment our whole

¹ James, *Varieties of Religious Experience*, p. 511.

² *Varieties of Religious Experience*.

outlook is colored by our past impressions and ideas. These are not present as such — they are not distinctly remembered — but a general feeling tone and tendency to reaction is established by them and is modified by each event of life; in short the total feeling background is effected by all our thoughts and experiences in such a way that they influence every passing moment. Our total past experience is in a sense summed and massed in the feeling background, which thus becomes a compendium of our history. But it is much more than that, it is largely the store-house of heredity as well. It is in the line of direct descent and inherits an endless amount of the wisdom gained with so much toil by our entire ancestry. Our instinctive reactions and adaptations, so far as conscious, belong here; we do not reason about them but obey necessarily a longing and an impulse which we simply find. This instinct-feeling and impulse is wiser than our reasonings. It is the accumulation of ages of experience and hence may be and must be trusted as against our little store of personally gathered knowledge and vainly reasoned syllogisms. In our personal sensory experience and our logical conclusions we are very young; in our feeling-mass we are older than the race. It is through the promptings of feeling that we respond blindly but surely to the whole of a situation, of which our little conscious selves see only a very small part. Hence feeling may be said to be in touch with a broader environment than the rational part of us, and to keep us in touch not only with the absent in space but with the distant past and even, in a sense, with the future. For it binds us to the whole of nature and to the laws of the cosmos, and hence may well be called prophetic. Through it, moreover, we are united to the race. It is here that racial antipathies and racial tendencies and in fact the solidarity of the entire human family become manifest. Nor can we stop here, for it is also the one conscious tie that binds us to the whole of sentient life.

This fact, moreover, that it is the affective life which in a sense unites us to the brutes, can be no reproach to it in the opinion of any one whose ideal for humanity is anything else than that of an animated syllogism. For it is feeling alone that gives value to life. Sensation and ideation merely report on the facts. If man were only a cold intellect who saw and judged, one thing would be to him as valuable as another — in fact for him there would be no values in the universe but only truths. It is only because man has feelings, emotions, impulses, that anything in heaven or earth has value. Moreover not only does the feeling background create values; it also is often that part of a man's mental make-up which for others *has* value. What

we love in our friend is not his sensations, nor chiefly his ideas and his reasoning power; it is principally that combination of indefinable psychic qualities—impulses, desires, likes and dislikes—which we call his disposition. So far, then, is the feeling-mass from being something which a man should hope in the course of evolution to get rid of, that as a fact, if he should get rid of it, no one would be able to find anything lovable in him, and he himself would be utterly unable either to love or even to value anything.

In short the feeling-mass is wider than the other departments of psychic life, deeper than they, and more closely identified with the self. A change in it means a change in personality. Sensations and ideas have a communicable and universal nature; this irrational residuum is peculiarly private and individual. It is the determinant of character—in one sense it *is* the character and the personality. From it the practical activity gets most of its energy and most of its guidance. On the other hand, though in one way peculiarly individual in comparison with the ideas and sensations, it seems in another sense more universal than they; for it is limitless and seems to extend on beyond any borders we can set, and to become continuous with a region which is not ours.

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A CORRECTION.

In the article entitled 'The Effect of the Brightness of Background on the Extent of the Color Fields and on the Color Tone in Peripheral Vision' in the last (Nov., 1905) issue of the REVIEW by Miss Fernald, an error occurs in the tables on p. 398. These tables are republished below in their correct form.

Nasal Meridian.

Color.	Background.	Seen as Red.	As Orange.	As Yellow.	Not Seen.	Total No. Tests.
Red.	For blue.	19 XVII.	16 IX.	9	3	73
"	" red.	37 XIV.	13 VII.	13	14	98
"	" green.	39 I.	3 II.	6	19	70
"	" yellow.	65	4		16	85

Color.	Background.	Seen as Orange.	As Red.	As Yellowish-Orange.	As Yellow.	Not Seen.	Total.
Orange.	For blue.	XXXII. 2		XI. 12	31	3	92
"	" red.	VI. 13		VIII. 12	28	8	75
"	" green.	XII. 19	II. 15	II. 20	23	8	101
"	" yellow.	24	II. 100	II	3	16	156

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